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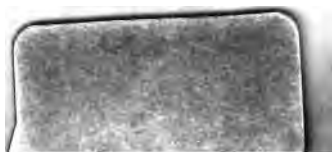
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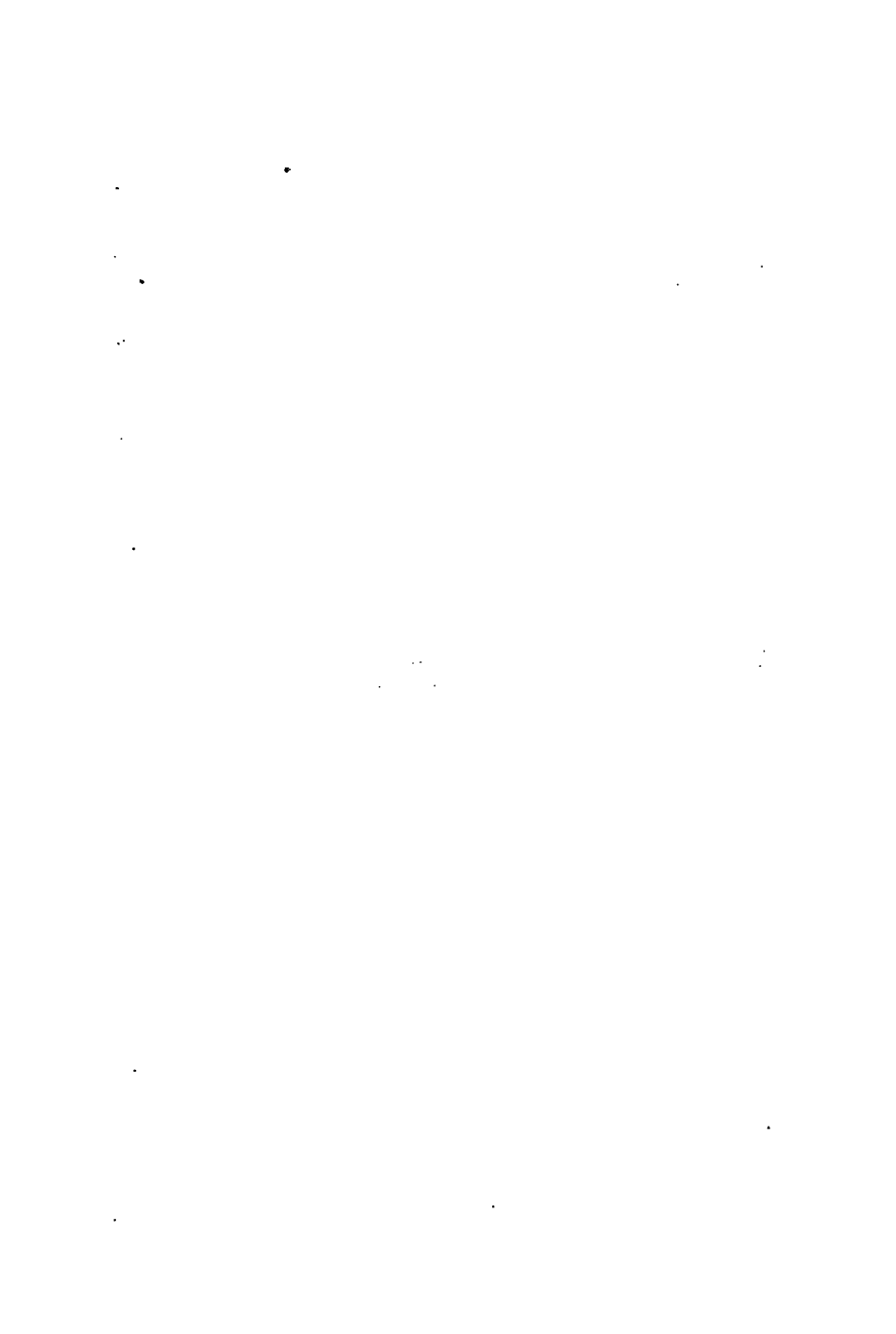
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SOLUTIONS TO THE QUESTIONS

OF THE

GENERAL EXAMINATION

AT

EASTER, 1848,

CONDUCTED BY

HER MAJESTY'S INSPECTORS OF SCHOOLS
FOR AWARDED CERTIFICATES;

WITH

APPENDICES,

INCLUDING

THE EXAMINATION PAPERS OF THE SEVERAL
TRAINING INSTITUTIONS.

BY TWO CERTIFICATED BATTERSEA MASTERS,

J. GOODALL, BLUE COAT SCHOOL, NORTHAMPTON,

AND

W. HAMMOND, MASTER OF THE COMMERCIAL
TRAVELLERS' SCHOOLS.

“ Pénétrez-vous, Monsieur, de l'importance de votre mission ; que son utilité vous soit toujours présente dans les travaux assidus qu'elle vous impose.”—*M. Guizot's Letter to French Schoolmasters.*

LONDON:

LONGMAN, BROWN, GREEN, AND LONGMANS.

1848.

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PREFACE.

THE following solutions have been prepared with a view to afford candidates for certificates of competency for the duties of a schoolmaster, an insight into the nature of the studies with which they must become familiar, in order to pass the ordeal of an examination by her Majesty's Inspectors of Schools. The solutions will not, it is hoped, be without their use to teachers in general, and to others who feel an interest in the development of those plans by which the status of elementary education in this country is destined to acquire a higher level than it has hitherto attained. To the younger members of the scholastic profession, it is hoped the solutions will afford valuable aid in preparing themselves for coping with a similar selection of questions at some future ordeal, like the one at which these were proposed. Candidates for certificates will do well to bear in mind, that the compilers of these pages disclaim any other merit than that of guides; they do not assume the pretension of skilful caterers of those

requisite items of knowledge, the acquisition of which would ensure the success of their possessor. A thorough comprehension of every paragraph in this book would not—except in connection with dependent and collateral information—enable a teacher to solve a similar series of questions, drawn from the same sources. There are, nevertheless, we conceive, several advantages to be derived by our brother-labourers, from a perusal of these pages. They may learn the general plan and character of examination papers; may be directed to some valuable repositories of essential information in respect to the object of their studies; and if they make these papers their own—if their interest in some of the processes exhibited in the solutions prompt them to the investigation of truths, which in many of the replies are necessarily assumed, this undertaking will not have been completely futile. Conciseness and precision have been aimed at, and authorities quoted for matters in which such an acknowledgement is due. We do not presume to hope that in carrying our design into execution, we shall have realised the expectations of all our readers. Amongst such a diversity of opinions, and so great a variety of mental aptitudes, habits, and tastes as is possessed by the class of men to whom this performance is specially addressed, we are prepared to be reminded of redundancies in this subject; of omissions in that; here of a departure from old, recognised forms; there a leaning towards new-fangled notions, of mere theoretical weight. But, despite such discouraging anticipations, we do not

hesitate to present our humble offering to elementary teachers, trusting that with their individual views of the executed task, they will recognise in it at least one element of utility—that of affording to the schoolmaster ample illustrations of the work which should engage his leisure, if he expect to become a recipient of the augmentation of salary provided by the Minutes of August and December, 1846.

It may occur to some of our readers that more than needful time has been consumed in bringing out these sheets, since the examination they profess to elucidate took place at Easter, between which and the date of publication a considerable interval has elapsed. In explanation of this delay, we must premise that the official nature of the papers made it requisite we should obtain the sanction of the authorities from whose department they emanated, as a necessary preliminary to publication. In reply to our application, we were courteously apprised, that an obstacle subsisted to the immediate prosecution of our design, inasmuch as it would be informal and inappropriate to permit official documents to make their first public appearance through any other than a recognised official channel. Agreeably to this intimation, we deferred publishing our solutions until the appearance, in the current month, of the examination papers in the Minutes of the Committee of Council on Education.

We cannot allow the present occasion to pass, without recording, on the part of ourselves personally, and, we may fairly venture to affirm, as representatives of a

large section of our class, those emotions of grateful acknowledgement which are so eminently due to the co-operative agency of the active though unobtrusive philanthropy of private individuals, and the patriotism of public men, to effect a great present and prospective amelioration in the character and condition of primary education, and of the humble instruments of its dissemination.

We disclaim every purpose of obsequiousness or parasitical adulation; but the fear of such imputations does not deter us from paying our humble tribute of grateful acknowledgement to the far-seeing benefactor, of our country and ourselves.

October, 1848.

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NOTA BENE.—With the exception of the paper on Mechanics, the following was the heading of each of the papers. The exception consists of an intimation that “Tate’s Mechanics” is considered the *Text-Book*:—

GENERAL EXAMINATION OF SCHOOLMASTERS.

EASTER, 1848.

Write, at the top of the page, your name, age, and the time that you have been the master of an elementary school, the name of your school, and the nearest post town.

This examination paper is divided into sections. You are not at liberty to answer more than one question in each section. Your knowledge and merit will be accounted greater if you answer the third or fourth question in each section, rather than the first or second question.

The questions in each examination paper are intended to afford you an opportunity of showing the extent of your knowledge on that subject; and, if you are enabled to show a competent knowledge, in a fair proportion, of the subjects of examination, the committee of council will be disposed to grant you a certificate of merit.

ARITHMETIC.

SECTION I.

1. Explain each step in the process of subtracting 750 from 805.
2. Explain each step of the process in multiplying 1087 by 5050.
3. Explain each step in the division of £70 10s. 11d. by 820, and express clearly what is the value of the remainder.

SECTION II.

1. Find by practice the value of 5 cwt. 1 qr. 19 lbs. at £3 15s. per cwt.
2. If 11 articles cost 15s. what would 17 cost? Explain each step of the process of working the sum.
3. If 5 men receive £18 15s. wages for 12 months, what will be the wages of 16 men for 20 months?

SECTION III.

1. Subtract $\frac{3}{4}$ of $\frac{1}{2}$ from $\frac{1}{2}$, and find the value of $\frac{1}{2}$ of 16s. 8 $\frac{1}{2}$ d.
2. What part of 5 guineas is 13s. 4d.?
3. Show that dividing the numerator of a fraction by any number gives the same result as multiplying the denominator by the same number.

SECTION IV.

1. Multiply .0017 by 450, and give the reason for the correct placing of the decimal point in the product.
2. Reduce 4s. 7d. to the decimal of a pound.

3. Divide 570 by .005, and give the reason for the correct placing of the decimal point in the quotient.
4. Extract the cube root of .04 to 3 places of decimals. Give the reason for the operation by which you divide the number into periods at the commencement of the process.

SECTION I.

1. "Explain each step in the process of subtracting 750 from 850."

$$\begin{array}{r}
 805 = 700 + 100 + 5 \\
 750 = 700 + 50 + 0 \\
 \hline
 55 = \quad * \quad 50 + 5
 \end{array}$$

The result is verified by the resolution of the respective numbers, as seen above; but to exhibit and prove the usual mode of operation, it must be premised that "the difference of two numbers is not affected by adding any equal number to each, and then performing the subtraction;" thus, $6 - 4 = 16 - 14$.

Now in order to make each figure in the subtrahend less than the corresponding one in the minuend, we will add a number of tens to the latter to accomplish the object; but the same must be added to the lower line; and as the numbers increase in a tenfold ratio, let us add ten tens, or one hundred to each. The figures will then stand thus,

<i>h.</i>	<i>t.</i>	<i>u.</i>
8	10	5
8	5	0
5		5

Hence the rule for "borrowing ten" and "carrying one."

2. "Explain each step in the process in multiplying 1087 by 5050."

This question requires us to find the resulting number after the continued addition of 1087 for 5050 times.

$$\begin{array}{r}
 1087 \\
 5050 \\
 \hline
 54350 = 50 \text{ times the multiplicand} \\
 5435 = 5000 \quad \text{,,} \quad \text{,,} \\
 \hline
 5489350 = 5050 \quad \text{,,} \quad \text{,,} \\
 \hline
 \hline
 \end{array}$$

As a cypher occupies the units' place in the multiplier, it is brought down to hold a similar position in the quotient. Then the operation of multiplying by 5 is commenced; and this is done in the same manner as though 5 held the units' place. Thus 5 times 7 units are 35 units = 3 tens' + 5 units; the units may be placed under the 5, and the 3 tens carried to the result of the tens. The whole operation will be clearly seen as follows:—

5 times 7 units = 35 units = 3 tens + 5 units.

,, ,, 8 tens = 40 tens = 4 hundreds.

,, ,, 1 thousand = 5 thousands.

Collecting these results, we obtain 5 thousand + 4 hundred + 3 tens + 5 units, or 5435. Now it was not 5, but 50, by which we were to multiply; consequently, the result is 10 times too small. To multiply by 10, the figures have only to be removed each one place to the left. Hence, by "bringing down the cypher," we obtain 50 times the multiplicand. The same process could be applied to the other significant figure of the multiplier; after the result is obtained, multiply by the third power of 10, or, which is the same

thing, remove the figures three places towards the left. Add the results, and we obtain the required product.

NOTE.—It can easily be perceived that whether we multiply 1087 by 5050, or 5050 by 1087, the product would be the same. Now were 5050 some other number, it would, very probably, be more convenient to consider it the multiplicand; thus, were it 5435, the product would be more concisely obtained by considering 5435 the multiplicand and 1087 the multiplier.

3. “ Explain each step in the division of £70 10s. 11d. by 820; and express clearly what is the value of the remainder.”

£	s.	d.	s.	d.
820)	70	10	11	(1 8½ — 484.
	20			
	14	10		
	820			
	590			
	12			
	7091			
	6560			
	531			
	4			
	2124			
	1640			
	484			

To take the 820th part of £70 10s. 11d., place the number and money in the form of divisor and dividend, as above.

Now, as 70 divided by 820, will not produce a whole number, bring the pounds to their equivalent in shillings, adding in the 10s. The number of shillings will then contain the divisor once with a remainder of 590

shillings. Bring these to pence by multiplying by 12; the quotient is contained in the pence 8 times, with a remainder of 531 pence = 2124 farthings, in which 820 are contained twice, i.e.—the farthings divided into 820 parts will allow of 2 farthings for one such part, and a remainder of 484, which is the number of farthings still undivided, being insufficient to produce one in each of 820 parts: hence there are 10s. 1d. left undistributed over the 820 portions.

SECTION II.

1. "Find, by practice, the value of 5 cwt. 1 qr. 19 lbs., at £3 15s. per cwt."

		£	s.	d.
Price of 1 cwt.	=	3	15	0
				5
		18	15	0
„ 1 qr.	$\frac{1}{4}$ cwt.	=	0	18 9
„ 14 lbs.	$\frac{1}{4}$ qr.	=	0	9 $4\frac{1}{2}$
„ 4 „	$\frac{1}{2}$ „	=	0	2 $8\frac{3}{4}$ $\frac{1}{2}$
„ 1 „	$\frac{1}{2}$ 4lbs.	=	0	0 $8\frac{3}{4}$ $\frac{1}{2}$
Total.. . . .		£20	6	$5\frac{1}{2}$ $\frac{3}{4}$

2 "If 11 articles cost 15s., what would 17 cost? Explain each step of the process of working the sum."

If the price of 11 articles be 15s., the price of 17, at the same rate, will be the same multiple of the price of 11 as 17 is of 11. Thus,

$$11 : 17 :: 15 : \text{to the required price,}$$

$$\text{or, } 1 : \frac{17}{11} :: 15 : \frac{15 \times 17}{11} = £1 \text{ 3s. 2d. } \frac{2}{3}$$

3. "If 5 men receive £18 15s. wages for 12 months, what will be the wages of 16 men for 20 months?"

If 5 men for 12 months receive £18 15s.

5 men for 1 month would receive £ $\frac{18\frac{3}{4}}{12}$.

And 1 man " " " $\frac{75}{4 \times 12 \times 5}$.

And 16 men " " " $\frac{75 \times 16}{4 \times 12 \times 5}$.

∴ 16 men for 20 months would } $\frac{75 \times 16 \times 20}{4 \times 12 \times 5} = 100$ £
 receive }

By compound proportion we should have,

$\left. \begin{array}{l} m. \quad m. \\ 5 : 16 \\ mo. \quad mo. \end{array} \right\} :: \begin{array}{l} £ \quad s. \\ 18 \quad 15 \end{array} : \frac{75 \times 16 \times 20}{4 \times 12 \times 5}$, the same as
 12 : 20

the previous result to be reduced;

$$\frac{75 \times 16 \times 20}{4 \times 12 \times 5} = £100$$

SECTION III.

1. (1) "Subtract $\frac{2}{3}$ of $\frac{1}{4}$ from $1\frac{1}{3}$, and (2) find the of value $\frac{3}{11}$ of 16s. 8½d."

$$(1.) \quad \frac{11}{18} - \frac{2}{3} \text{ of } \frac{1}{4} = \frac{11}{18} - \frac{2}{3} \times \frac{1}{4} = \frac{11}{18} - \frac{1}{6} = \frac{11-3}{18} = \frac{8}{18} = \frac{4}{9}$$

$$(2.) \quad \begin{array}{l} s. \quad d. \\ 16 \quad 8\frac{1}{2} \end{array} \times \frac{3}{11} = \frac{\begin{array}{l} s. \quad d. \\ 16 \quad 8\frac{1}{2} \end{array} \times 3}{11} = \begin{array}{l} s. \quad d. \\ 4 \quad 6\frac{1}{2} \end{array} \frac{3}{11}$$

2. "What part of 5 guineas is 13s. 4d.?"

s. d.

13 4 = 40 fourpenny pieces

5 guineas = 315 "

∴ 13 4 is of 5 guineas, 40 times the 315th part ;

$$\text{or } \frac{40}{315} = \frac{8}{63}.$$

3. "Show that dividing the numerator of a fraction by any number gives the same result as multiplying the denominator by the same number."

Let it be required to divide the fraction $\frac{6}{11}$ by 3.

$$\frac{6 \div 3}{11} = \frac{2}{11} ; \frac{6}{11 \times 3} = \frac{6}{33}$$

$$\text{But } \frac{6}{33} = \frac{2}{11}.$$

The same may be shown by dividing a line representing unity into 11 equal parts, and each of these again into 3 others; when the third part of 6 of the elevenths would, in length, be equal to 6 of the thirty-thirds. (See paper on Algebra, Sec. ii. Ques. 2.)

SECTION IV.

1. "Multiply .0017 by 450, and give the reason for the correct placing of the decimal point in the product."

$$\begin{array}{r} .0017 \\ 450 \\ \hline 850 \\ 68 \\ \hline .765 \\ \hline \hline \end{array}$$

In performing this operation, we are finding the product of $\frac{17}{10000}$ by 450: for $.0017 = \frac{17}{10000}$. Hence, after finding, as above, the product of 17 by 450, we have to divide by 10000; this is done by "pointing

off" four figures. Thus the reason is seen for *pointing off as many figures in the quotient as there are decimal places in the multiplier and the multiplicand together.*

2. "Reduce 4s. 7d. to the decimal of a pound."

$$7 \text{ pence} = \frac{7}{12 \times 20} \text{ of a pound.}$$

$$4 \text{ shillings} = \frac{4}{20} \quad " \quad "$$

$$\text{But } \frac{7}{12 \times 20} + \frac{4}{20} = \frac{7}{240} + \frac{48}{240} = \frac{55}{240} =$$

$$\frac{5500000}{240 \times 100000} = \frac{22916\frac{2}{3}}{100000} = .22916\frac{2}{3}; \text{ but } \frac{2}{3}, \text{ when reduced to a decimal, becomes } .6; \text{ therefore the 4s. 7d., reduced to the decimal of a pound is } .22916.$$

The form generally employed and deduced from the above is as follows:—

$$\begin{array}{r} 12) 7d. \\ 20 \overline{) 4.583} \\ \underline{ 22916} \\ \text{£} \cdot 22916 \end{array}$$

3. "Divide 570 by .005, and give the reason for the correct placing of the decimal point in the quotient."

$$\begin{array}{r} .005 \overline{) 570} \\ \underline{ 114000} \end{array}$$

$.005 = \frac{5}{1000}$; therefore when we have divided by 5, as seen above, we have divided by a number 1000 times greater than the true divisor: therefore the result must be multiplied by 1000, or "*place as many figures after the one obtained, by dividing the units, as there are decimal places in the divisor.*"

4. "Extract the cube root of .04 to 3 places of decimals. Give the reason for the operation by which you

divide the number into periods at the commencement of the process."

The cube of 1, 10, 100, \dots is formed of the unit followed by three times as many cyphers as there are in the number taken. A number, therefore, between 10 and 100 has its cube between 1000 and 1000000; consequently its cube is formed of 4, 5, or 6 figures, according to the proximity of its value to 10, or 100. Generally, the cube of any number will contain three times its number of figures, minus one or two, according to the value of the first figure in the root. Hence the reason for dividing a number, whose cube root is to be extracted into periods of three figures each, commencing from the units' place.

Now for the cube root of .04; we must add seven cyphers in order to obtain three decimal places in the root; for the periods commence "from the units' place."

[illegible]

The method here employed, is published in "Tate's Principles of Arithmetic," a copy of which every teacher should possess. The process for obtaining the trial divisor is original and elegant. It will be comprehended

from the following explanation, in which it is assumed that the mode of deriving the rule for the extraction of the cube root is understood. By this method, squaring the root already found, and then multiplying by 3 for a new divisor, are superseded by the simple process of addition. The operation commences after the second figure in the root is obtained ; when the two figures found form that part of the root in the formula, $(a + b)^3 = a^3 + 3 a^2 b + 3 a b^2 + b^3$, represented by a . Now in the preceding example (leaving out of consideration that the figures found are decimals, as the reasoning will not be affected thereby), the a is 34, which may be resolved into $30 + 4$; squaring these by the binomial and multiplying by 3, we have, $3 (30^2 + 2 \times 30 \times 4 + 4^2) = 2700 + 2 \times 360 + 3 \times 16$, the first of which numbers and the greater factor of the others are all previously obtained (marked (c), (d), and (e), respectively); for 27 stands two places to the left, and 36 one. Hence the sum of once (c), twice (d), and thrice (e) will give three times the square of 34. The addition is conveniently performed, as in the example, by placing the sum of (d) and (e) under the obtained sum of the three products, and then adding the three numbers which are directly under each other. The advantage of this artifice becomes immensely great, as the number of figures in the root increases.

MENSURATION.

SECTION I.

1. Prove the rule of cross multiplication.
2. Prove a rule for determining the number of standard rods of brick-work in a wall.
3. Prove a rule for determining the area of a trapezoid.

SECTION II.

1. How many cubical feet of timber are there in the flooring of a room $\frac{3}{4}$ in. thick, and 17 ft. 6 in. in length by 15 ft. 3 in. in breadth?
2. In a wall 10 ft. high, 15 ft. long, and $2\frac{1}{2}$ bricks thick, there is an arched door-way 4 ft. wide and 6 ft. high to the springing of the arch, which is semi-circular; how many standard rods of brick-work are there in the wall?
3. What is the weight of a circular iron ring whose inner diameter is 18 in., and whose section is a circle 2 in. in diameter, the weight of a cubic foot of the iron being 450 lbs.?

SECTION III.

1. After measuring a piece of cloth, to contain 90 yards, I find that the yard measure that I have used is too short by $\frac{1}{30}$ th part; what is the true measure of the cloth?
2. How many square inches of tin plate are required to make an open cylindrical vessel to contain a gallon whose height is equal to one-half of its diameter?

N.B.—An imperial gallon contains 277,274 cubical inches.

3. Show that less tin will be used in making a vessel of the dimensions given in the last example, than in making one of any other dimensions but of a cylindrical form and the same capacity.
4. Investigate Thomas Simpson's rule for determining the area of a plane surface bounded by an irregular line.
5. Investigate a formula for determining the quantity of earth to be taken out of a cutting for a road, the width of the road and the slope of the banks being given.

SECTION IV.

1. Describe Gunter's chain.
2. Construct a field-book for a three-sided field of which one side has an irregular form, and the other two are straight lines ; assuming any dimensions whatever.
3. Describe and explain the vernier.
4. Describe the spirit level and its adjustments.

SECTION I.

1. " Prove the rule of cross multiplication."

Let us find the area of the floor in ques. 1. sec. ii. to exemplify the rule.

<i>ft.</i>		<i>in.</i>	
17	„	6	
15	„	3	
<hr/>			
262	„	6	
4	„	4	„ 6
<hr/>			
266	„	10	„ 6
<hr/>			

Here the product of the 6 by 15 is divided by 12, and the remainder put in the inches' place; the quotient is carried to the square feet. In multiplying by the 3 in., the first remainder from the division of 12 is put one place further to the right; the process is then continued, dividing each product by 12 and placing the remainder in order towards the left hand. Now the result which is generally termed 266 feet, 10 inches, 6 parts, is really 266 feet, 10 parts, 6 inches; the parts being rectangles of 1 by 12 in., which, of course, are each 12 square inches in area. The result expressed in feet and fractions of a foot would stand thus,

$$266 + \frac{10}{12} + \frac{6}{144}.$$

Let us now prove that this is the true result, by working with the 17 ft. 6 in. and the 15 ft. 3 in. in the form of their equivalents, $17\frac{1}{2}$ and $15\frac{1}{2}$ ft.; thus,

$$\begin{array}{r} 17 + \frac{1}{2} \\ 15 + \frac{1}{2} \\ \hline 262 + \frac{1}{2} \\ 4 + \frac{1}{2} + 1\frac{1}{4} \\ \hline 266 + 1\frac{1}{2} + 1\frac{1}{4} \end{array}$$

The first product is obtained by multiplying by the 15 whole numbers, and the second by the fraction $\frac{1}{2}$, care being taken to retain the duodecimal scale, or the decrease of the numbers from the left in a twelve-fold ratio.

2. "Prove the rule for determining the number of standard rods of brickwork in a wall."

Rule:—Multiply the number of feet in the surface of the wall by the number of half bricks in the thickness of the wall, and divide the result by 3×272 .

The standard rod is 272 feet of surface of brickwork,

of a brick and a half thick. This rod is in surface nearly the same as that in land measure for the square of $5\frac{1}{2}$ yards, or 16.5 feet equals 272.25.

Let a ft. = the length of the wall

„ b ft. = the height „

And c = the number of half bricks the wall is in thickness

Then $a \times b$ = surface of the wall

$\frac{c}{3}$ = the number of times the standard thickness is contained in the whole thickness.

$\therefore \frac{a \times b \times c}{3}$ = the number of feet in the wall of the standard thickness.

$\therefore \frac{a \times b \times c}{3 \times 272}$ = the number of standard rods.

3. "Prove a rule for determining the area of a trapezoid."

"The area of a trapezoid is equal to half the area of a rectangle, having the same altitude, and whose base equals the sum of the parallel sides of the trapezoid."—*Tate's Geometry*. Art. 43.

SECTION II.

1. "How many cubical feet of timber are there in the flooring of a room $\frac{3}{4}$ in. thick and 17 ft. 6 in. in length by 15 ft. 3 in. in breadth?"

$$\begin{array}{ccccccc}
 \text{ft.} & \text{in.} & \text{ft.} & \text{in.} & \text{in.} & \text{ft.} & \text{in.} & \text{ft.} \\
 17 & ,, & 6 \times 15 & ,, & 3 \times \frac{3}{4} = 17\frac{1}{2} \times 15\frac{1}{2} \times \frac{3}{4 \times 12} \\
 & & & & \text{c. ft.} \\
 & & & & \frac{35 \times 61 \times 3}{2 \times 4 \times 4 \times 12} = 16\frac{87}{128}
 \end{array}$$

2. "In a wall 10 ft. high, 15 ft. long, and $2\frac{1}{2}$ bricks thick, there is an arched doorway 4 ft. wide and

6 ft. high to the springing of the arch, which is semi-circular; how many standard rods of brick-work are there in the wall?"

$\frac{15 \times 10 \times 5}{3 \times 272}$ = number of rods including the doorway.

$\frac{6 \times 4 \times 5}{3 \times 272}$ = number of rods in the door-way to the height of the spring.

$\frac{4^2 \times .7854 \times 5}{3 \times 272 \times 2}$ = number of rods in the arch of the doorway.

$\therefore \frac{15 \times 10 \times 5}{3 \times 272} - \left(\frac{6 \times 4 \times 5}{3 \times 272} + \frac{4^2 \times .7854 \times 5}{3 \times 272 \times 2} \right)$
 $= \frac{(15 \times 10 - 6 \times 4 - 8 \times .7854)5}{3 \times 272} = .7335 \text{ rods.}$

3. "What is the weight of a circular iron ring whose inner diameter is 18 in., and whose section is a circle 2 in. in diameter, the weight of a cubic foot of iron being 450 lbs.?"

$\frac{18}{\text{in.}} + \frac{2}{\text{in.}} = 20$ = diameter of ring to the centre of circular rod.

$20 \times 3.1416 = 62.832$ = the length of circular rod in inches.

$2^2 \times .7854 = 3.1416$ = area of section of circular rod in inches.

$62.832 \times 3.1416 = 197.393$, solid content in in.

$\frac{197.393}{1728} \times 450 = 51.4044 \text{ lbs. weight.}$

SECTION III.

1. "After measuring a piece of cloth, to contain 90 yards, I find that the yard measure that I have used is

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Let a = diameter of the base; $\frac{a}{2}$ = height of cylinder; and $\widehat{\Pi}$ = the constant quantity, 3.1416.

Then $a^2 \frac{\widehat{\Pi}}{4}$ = surface of base.

And $a \frac{\widehat{\Pi}}{2}$ convex surface.

$\therefore a^2 \frac{\widehat{\Pi}}{4} + a^2 \frac{\widehat{\Pi}}{2} = \frac{\widehat{\Pi} \cdot 3 a^2}{4}$ = whole surface,

Also $\frac{\widehat{\Pi} a^3}{8}$ = solidity of cylinder.

Now let a (the base) be increased or diminished by any quantity n , such that $a-n$ shall be positive.

Then $a \pm n$ = diameter of base,

And $(a \pm n)^2 \times \frac{\widehat{\Pi}}{4}$ = area of base.

The contents of the cylinder under the new conditions remain unaltered.

$\therefore \frac{\widehat{\Pi} a^3}{8} \div (a \pm n)^2 \times \frac{\widehat{\Pi}}{4} = \frac{a^2}{2(a \pm n)^2}$ = height of cylinder.

And $\widehat{\Pi} (a \pm n) \times \frac{a^2}{2(a \pm n)^2} = \frac{\widehat{\Pi} a^2}{2(a \pm n)}$ = convex surface.

$\therefore (a \pm n)^2 \times \frac{\widehat{\Pi}}{4} + \frac{\widehat{\Pi} a^2}{2(a \pm n)}$ whole surface of cylinder.

$$(a \pm n)^2 \times \frac{\widehat{\Pi}}{4} + \frac{\widehat{\Pi} a^2}{2(a \pm n)}$$

$\frac{\widehat{\Pi} \cdot 3 a^2}{4}$ = the ratio between the surface in the assumed case and

given and accordingly as this ratio is greater or less than unity, so will the surface in

upon the line DB ; supposing then, that the figure ADB does not terminate in a point, but in an ordinate at B ; the number of divisions into which the area will be divided is $n-1$, n being the number of ordinates. Now, let AD , a , d , $\&c.$ be the ordinates whose lengths respectively are P^1 , P^2 , P^3 , $\dots P^n$; also, let other perpendiculars e , e , e , $\&c.$, be erected upon the line DB , making D , e , e , e , d , $\&c.$, equal to two-thirds the previous common distance; and join the points A , e , e , e , d , $\&c.$, by straight lines. Then the area of the right lined figure,

$A e e a \dots B D = \text{area } A e + e e + e d + \&c.$
to $n-1$ terms.

$$= \frac{D e}{2} (A D + e e_1) + \frac{e e}{2} (e e_1 + e e_2) + \frac{e d}{2} (e e_2 + a d) + \&c. \text{ to } n-1 \text{ terms.}$$

Here we perceive that every perpendicular is twice expressed within the brackets, except the ordinates P , and P^n , which are once expressed only.

Further,

$$\frac{D e}{2} = \frac{e e}{2} = \&c. = \frac{D d}{3}, \text{ or, putting } D \text{ for}$$

the common distance between the ordinates, $\frac{D d}{3} = \frac{D}{3}$

Now, when D is taken comparatively short, a , d , or P^2 , may be taken as the mean between $e e$ and $e e$ instead of $a d$, the real mean. Therefore, considering this approximation as the real value,

$$e e + e e = 2 a d = 2 P^2 : \text{ and } e e + e e = 2 a d = 2 P^4.$$

In a similar manner $2 P^6, 2 P^8$, &c., would be obtained.

$$\begin{aligned} \therefore \frac{D e}{2} (A D + e e_1) + \frac{e e}{2} (e e_1 + e e_2) + \frac{e d}{2} \\ (e e_2 + a d_1) + \&c. \text{ to } n-1 \text{ terms} \\ = \frac{D d}{3} (A D + e e_1 + 2 e e_2 + 2 a d_1 + \&c. \text{ to } n \\ \text{terms}) \\ = \frac{D}{3} (P^1 + 4 P^2 + 2 P^3 + 4 P^4 + 2 P^5 + \dots P_n) \\ = \frac{D}{3} \{ P^1 + P_n + 4(P^2 + P^4 + P^6 + \dots P_{n-1}) \\ + 2(P^3 + P^5 + P^7 + \dots P_{n-2}) \} \end{aligned}$$

This formula, lastly obtained, presents Thomas Simpson's rule, viz., area equals the sum of the extreme, four times the sum of the even, and twice the sum of the odd ordinates, multiplied by the third of the common distance between the ordinates.

It must be remarked that we have in the last expression supposed the number of ordinates to be odd: were they even in number, then P_{n-1} would become P_{n-2} and P_{n-2} , P_{n-1} ; in short, those quantities in the expression would change positions.

5. "Investigate a formula for determining the quantity of earth to be taken out of a cutting for a road, the width of the road and the slope of the banks being given?"

As some of the preceding work has been gone through upon the assumption that the student possesses Mr. Tate's Geometry, we shall here refer to that work. In the division Land Surveying, Arts. 23, 24, ample information will be found upon the subject of this question.

SECTION IV.

1. "Describe Gunter's chain."

This is an instrument used in Land Surveying, consisting of 100 links of equal lengths; and the chain is of such dimensions that a space of ground one chain in width and ten in length is an acre. Hence it follows that a Gunter's chain must be twenty-two yards in length.

It is a convenient implement for taking field ad-measurements, from its decimal division and subdivi-sion; every ten links being distinguished by a peculiar mark, generally a piece of brass of a particular shape at the termination of each tenth link up to the fiftieth, either way. The length of each link is

$$\frac{22 \times 3 \times 12}{100} = 7.92 \text{ inches.}$$

Since the link is the 100th part of the chain, any number of links can be expressed decimally; thus, 3 ch. 45 lin. = 3.45 chains.

2. "Construct a field-book for a three-sided field of which one side has an irregular form and the other two are straight lines; assuming any dimensions whatever."

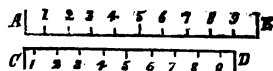
Upon this and the following question (ques. 4) in-formation will be found in Tate's Geometry and Men-suration.

4. "Describe the spirit level and its adjustments."

3. "Describe and explain the vernier."

The Vernier, or, Nonius, so called from the names of its inventors, is a sliding-scale, consisting of a larger and a smaller portion, the latter of which is made to slide upon the former. A unit of length as an inch on the large part may be divided into n equal parts; then each part will be $\frac{1}{n}$ of the unit. A length equal to $n-1$

of the former parts is then measured upon the small, or sliding portion, and that length similar to the unit is divided into n equal parts. It is evident that, if the sliding-scale is moved so that the first lines of division in each will coincide, the distance moved over will be equal to the difference between the length of the respective parts of division, or, $\frac{1}{n} - \frac{1}{n} \frac{(n-1)}{n} = \frac{1}{n} - \frac{n-1}{n^2} = \frac{1}{n^2}$.



Hence, if A B be an inch of such a scale divided decimally and C D be nine-tenths of an inch upon the sliding scale also divided into tenths: then, if C D be moved along till the position of the figures 1 and 1 coincide, the scale will have slid $\frac{1}{10^2}$ or $\frac{1}{100}$; if 2 and 2 coincide, then $\frac{2}{100}$; if 3 and 3, then $\frac{3}{100}$; &c.

The advantage of the application of the vernier is obvious, where accuracy and minuteness of admeasurement are necessary, as in the case of the barometer, in which the division above is the one generally adopted.

In its application to instruments for the measurement of angles the division usually adopted is that of 29 half degrees into 30 parts, when the coincidence of the 1st and 2nd, &c. lines will indicate $\frac{1}{60}$, $\frac{2}{60}$ &c. or, 1, 2, &c. minutes respectively. The same result is obtained when 19 third-degrees are divided into 20 equal parts.

ALGEBRA.

SECTION I.

1. Multiply $a^2 - a x + x^2$ by $-a x$. Multiply $x^2 + (a-b)x - a b$ by $x + b$.
2. What is the principle of subtracting a quantity containing a minus term?
Take $b - c$ from a , show the working, and illustrate it simply.
3. Subtract $a^2 - (b^2 - c^2)$ from $(a - b - c)^2$ and divide $x^3 - 3 a^2 x - 2 a^3$ by $x - 2 a$.

SECTION II.

1. Shew that $\frac{3x^2 + 6x + 5}{x + 4} = 3x - 6 + \frac{29}{x + 4}$
and simplify $2 - \frac{2x}{\frac{5}{2}}$
2. Prove the rule for dividing one fractional expression by another.

Divide $\left(\frac{x}{y} - \frac{y}{x}\right) \left\{ \frac{1}{x-y} + \frac{1}{x+y} \right\}$
by $\frac{x+y}{x-y}$.

SECTION III.

1. Find the value of x in each of these equations—

$$\frac{2x}{5} + \frac{x-2}{3} = 2x - 7.$$

$$\frac{a}{a+2x} - \frac{b}{a+x} = 0.$$

2. What number is that, the double of which exceeds its half by 6?

The difference of two numbers, and a quarter part of their sum are each equal to 2; find the numbers.

3. If A does a piece of work in 10 days, which A and B can do together in 7 days, how long would B take to do it alone?

Find the amount of P £ at compound interest for n years, the interest being paid yearly.

SECTION I.

1. (1) "Multiply $a^2 - ax + x^2$ by $-ax$.
 (2) "Multiply $x^2 + (a-b)x - ab$ by $x + b$."

$$(1) \quad \begin{array}{r} a^2 - ax + x^2 \\ - ax \\ \hline -a^3x + a^2x^2 - ax^3 \end{array} = a^2x^2 - a^3x - ax^3$$

$$(2) \quad \begin{array}{r} x^2 + (a-b)x - ab \\ x + b \\ \hline x^3 + x^2(a-b) - abx \\ x^3b + bx(a-b) - ab^2 \\ \hline x^3 + ax^2 - b^2x - ab^2 \end{array}$$

2. (1) "What is the principle of subtracting a quantity containing a minus term?"

(2) "Take $b - c$ from a , show the working and illustrate it simply."

(1) Consider the sign positive and proceed as in addition.

$$(2) \quad a - (b - c)$$

$$\begin{array}{r} a \\ b - c \\ \hline a - b + c \end{array}$$

Here we have simply changed the signs of the quantities to be subtracted, and appended them to the a . Why the sign of b is changed is obvious; and why the minus sign of c is changed to plus is also easy of apprehension: for when b has been subtracted by changing its sign, too much by the amount c has been taken from a ; because it was not b which had to be subtracted, but b less by c . Therefore c must be added to the result.

Let $a = 10$; $b = 8$ and $c = 5$

$$10 - (8 - 5) = 10 - 3 = 7$$

$$\text{or } 10 - 8 + 5 = 7.$$

3. (1) "Subtract $a^2 - (b^2 - c^2)$ from $(a - b - c)^2$."

(2) "Divide $x^3 - 3a^2x - 2a^3$ by $x - 2a$."

$$(1) (a - b - c)^2 - \{a^2 - (b^2 - c^2)\}$$

$$\begin{aligned} (a - b - c)^2 &= (a - b)^2 - 2c(a - b) + c^2 \\ &= a^2 + b^2 + c^2 - 2ab - 2ac + 2bc \\ a^2 - (b^2 - c^2) &= a^2 - b^2 + c^2 \\ \hline 0 \quad 2b^2 \quad 0 &- 2ab - 2ac + 2bc = 2 \\ &2(b^2 - ab - ac + bc) \end{aligned}$$

$$(2) \begin{array}{r} x - 2a \overline{) x^3 - 3a^2x - 2a^3} \quad (x^2 + 2ax + 2a^2) \\ \underline{x^3 - 2ax^2} \end{array}$$

$$\begin{array}{r} * \quad 2ax^2 - 3a^2x \\ \underline{2ax^2 - 4a^2x} \\ * \quad \quad a^2x - 2a^3 \\ \underline{a^2x - 2a^3} \\ * \quad \quad \quad * \end{array}$$

SECTION II.

$$1. (1) \text{ "Show that } \frac{3x^3 + 6x + 5}{x + 4} = 3x - 6 + \frac{29}{x + 4} \text{ "}$$

c

$$(2) \text{ "Simplify } 2 - \frac{3x}{2}$$

$$(1) \quad \begin{array}{r} x+4 \overline{) 3x^2 + 6x + 5} \phantom{+ 5(3x - 6 + \frac{29}{x+4})} \\ \underline{3x^2 + 12x} \\ * \quad \quad \quad \underline{- 6x + 5} \\ \quad \quad \quad \underline{- 6x - 24} \\ \quad \quad \quad \quad \quad \quad \underline{29} \\ \quad \quad \quad \quad \quad \quad * \quad \underline{x+4} \end{array}$$

$$(2) \quad \frac{2 - \frac{3x}{2}}{5} = \frac{(4 - 3x) \div 2}{5} \\ = \frac{4 - 3x}{5 \times 2} = \frac{4 - 3x}{10}.$$

2. (1) "Prove the rule for dividing one fractional quantity by another."

$$(2) \text{ "Divide } \left(\frac{x}{y} - \frac{y}{x} \right) \quad \left\{ \frac{1}{x-y} + \frac{1}{x+y} \right\}$$

by $\frac{x+y}{x-y}$ "

(1) Let $\frac{a}{b}$ be a fraction which is to be divided by another, $\frac{c}{d}$. We have to prove that, $\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \times \frac{d}{c}$

Let $\frac{a}{b}$ be divided by c , we have,

$$\frac{a}{b} \div c = \frac{a}{b \cdot c}$$

But c was not the quantity by which we were to have divided, it was the d th part of c . Therefore the re-

sult is d times too small, and consequently must be multiplied by d ; thus,

$$\frac{a}{b \ c} \times d = \frac{a \ d}{b \ c}.$$

$$\begin{aligned} (2). \quad & \left(\frac{x}{y} - \frac{y}{x} \right) \left(\frac{1}{x-y} + \frac{1}{x+y} \right) \div \frac{x+y}{x-y} \\ &= \left(\frac{x}{y} - \frac{y}{x} \right) \left(\frac{1}{x-y} + \frac{1}{x+y} \right) \frac{x-y}{x+y} \\ &= \left(\frac{x}{y} - \frac{y}{x} \right) \left(\frac{1}{x+y} + \frac{x-y}{(x+y)^2} \right) \\ &= \frac{x}{y(x+y)} + \frac{x(x-y)}{y(y+y)^2} - \frac{y}{x(x+y)} - \frac{y(x-y)}{x(x+y)^2} \\ &= \frac{x^2(x+y) + x^2(x-y) - y^2(x+y) - y^2(x-y)}{xy(x+y)^2}, \end{aligned}$$

brought to a common denominator.

$$\begin{aligned} &= \frac{xy(x+y)^2}{xy(x+y)^2} \\ &= \frac{2x^2 - 2xy^2}{xy(x+y)^2} = \frac{2x(x^2 - y^2)}{xy(x+y)^2} \\ &= \frac{2(x-y)}{y(x+y)} \end{aligned}$$

SECTION III.

1. "Find the value of x in each of these equations."

$$(1) \quad \frac{2x}{5} + \frac{x-2}{3} = 2x-7$$

$$(2) \quad \frac{a}{a+2x} - \frac{b}{a+x} = 0$$

$$(1) \quad \frac{2x}{5} + \frac{x-2}{3} = 2x-7$$

$6x + 5x - 10 = 30x - 105$; transposing and
changing all the signs, $30x - 6x - 5x = 105 - 10$

$$19x = 95$$

$$\therefore x = 5$$

$$\begin{aligned}
 (2) \quad & \frac{a}{a+2x} - \frac{b}{a+x} = 0 \\
 & a(a+x) - b(a+2x) = 0 \\
 & a^2 + ax - ab - 2bx = 0 \\
 & x(a-2b) = ab - a^2 \\
 & \therefore x = \frac{ab - a^2}{a - 2b}
 \end{aligned}$$

See *Appendix, Algebra.*

2. (1) "What number is that, the double of which exceeds its half by 6?"

(2) "The difference of two numbers, and a quarter part of their sum are each equal to 2; find the numbers."

(1) Let x = the number
Then $2x$ = its double
And $\frac{x}{2}$ = its half

$$\therefore 2x - \frac{x}{2} = 6$$

$$4x - x = 12$$

$$3x = 12$$

$$\therefore x = 4$$

(2) Let x = the greater
Then $x - 2$ = the less

Now the difference of these numbers is equal to the fourth part of their sum.

$$\therefore x - (x - 2) = \frac{x + (x - 2)}{4}$$

$$4x - 4x + 8 = x + x - 2$$

$$2x = 10$$

$$\therefore x = 5, \text{ the greater}$$

$$\text{And } x - 2 = 3, \text{ the less.}$$

3. (1) "If A does a piece of work in 10 days, which A and B can do in 7 days, working together; how long would B take to do it alone?"

(2) "Find the amount of £P. at compound interest for n years, the interest being payable yearly."

(1) Let x = the number of days in which B can complete the work by himself,

Then $\frac{1}{x}$ = the part B would do in 1 day.

Now A does it in 10 days

$\therefore \frac{1}{10}$ = the part A does in 1 day.

The part done in 1 day by A and B working together would be, $\frac{1}{10} + \frac{1}{x}$

But they can together complete it in 7 days; and therefore they can do $\frac{1}{7}$ per day.

$$\text{Hence, } \frac{1}{10} + \frac{1}{x} = \frac{1}{7}$$

$$7x + 70 = 10x$$

$$10x - 7x = 70$$

$$\therefore x = 23\frac{1}{3} \text{ days.}$$

(2) Let r = the interest of £1 for a year; the amount of £1 for a year will then be $1 + r$.

To find the amount of succeeding years, we have the following proportions: as the principal of the first year is to the principal of any succeeding year, so is the amount of the first year to the amount of that succeeding year, Thus—

$$1 : 1 + r :: 1 + r : (1 + r)^2 = \text{the amount of 2nd year}$$

$$1 : (1 + r)^2 :: 1 + r : (1 + r)^3 = \text{ " " 3rd "}$$

$1 : (1 + r)^{n-1} :: (1 + r) : (1 + r)^n = \text{ " " } n\text{th year}$
 $(1 + r)^n$ being the amount of £1 for n years, the amount of £P will be $P \cdot (1 + r)^n$.

See Appendix, Algebra.

GEOMETRY.

SECTION I.

1. Define a plane superficies, and a circle.
2. Draw a straight line perpendicular to a given straight line from a given point in it.
3. The angles at the base of an isosceles triangle are equal to each other, and if the equal sides be produced the angles on the other side of the base shall be equal.

SECTION II.

1. Prove that the sum of the three angles of a triangle equals two right angles. Given the value of two angles of a triangle, how is the value of the third ascertained?
2. Prove that parallelograms on the same base and between the same parallels are equal to one another.
3. In any right angled-triangle, the square which is described upon the side subtending the right angle is equal to the squares described upon the sides containing the right angle.

SECTION III.

1. If a straight line be divided into two equal parts, and also into two unequal parts, the rectangle contained by the unequal parts together with the square of the line between the points of section is equal to the square of half the line.
2. In any triangle the square of the side subtending any acute angle is less than the squares of the sides containing that angle by twice the rectangle

contained by either of these sides, and the straight line intercepted between the perpendicular let fall upon it from the opposite angle and the acute angle;—prove only the first case of this proposition.

SECTION IV.

1. Construct a triangle whose area shall be equal to that of a given trapezium.
2. Show how to make a square double a given square.
3. Show that the diagonals of a parallelogram bisect each other.

N.B.—As it may fairly be assumed that every schoolmaster is possessed of a copy of Euclid's Elements; and as the following questions may be answered in the very words of Euclid; it will scarcely be necessary to give other solutions than direct reference to the particular proposition, the knowledge of which is presupposed in the questions. Schoolmasters will find the recently published "Geometry and Mensuration," by Mr. Tate, a most valuable auxiliary in acquiring a rapid knowledge of the essentials of the science. It may be briefly characterised as Euclid divested of undue technicalities and redundancy.

A regard to economy in publication requires the use of as few diagrams as possible; hence the reason of aiming to dispense with them, as in this paper.

SECTION I.

1. "Define a plane (1) superficies, and (2) a circle."
- (1) A plane superficies is a surface, any two points of which being joined the straight line between them will be wholly within the superficies.

(2) A circle is a plane figure bounded by one line, called the circumference, which is such that all points of it are equally distant from a point within the circle called the centre.

2. "Draw a straight line perpendicular to a given straight line from a given point in it."

Euclid i. 11. Tate, Art. 23.

3. "The angles at the base of an isosceles triangle are equal to each other; and if the equal sides be produced the angles on the other side of the base shall be equal."

Euclid i. 5. Tate, Art. 18.

SECTION II.

1. "Prove that the sum of the three angles of a triangle equals two right angles. Given the value of two angles of a triangle, how is the value of the third ascertained?"

Euclid i. 32. Tate, Art. 34.

The sum of the three angles being two right angles, or 180° ; if two be known, they must be deducted from 180° , to leave the third.

2. "Prove that parallelograms on the same base and between the same parallels are equal to one another."

Euclid i. 35. Tate, Art. 48.

3. "In any right-angled triangle the square which is described upon the side subtending the right angle is equal to the square described upon the sides containing the right angle."

Euclid i. 47. Tate, Art. 45.

SECTION III.

1. "If a straight line be divided into two equal parts, and also into two unequal parts, the rectangle contained by the unequal parts together with the square of the

line between the points of section is equal to the square of half the line."

Euclid ii. 5.

2. "In any triangle the square of the side subtending any acute angle is less than the squares of the sides containing the angle by twice the rectangle contained by either of these sides, and the straight line intercepted between the perpendicular let fall upon it from the opposite angle and the acute angle;—prove only the first case of this proposition."

Euclid ii. 13. Tate, Art. 50.

SECTION IV.

1. "Construct a triangle whose area shall be equal to that of a given trapezium."

From Euclid ii. 14, describe a square equal to the given trapezium. A triangle with a base equal to that of the square so found, and with twice the altitude of the square; or with an altitude equal to that of the square, but a base twice as large will be equal to the square (Euclid i. 42), and consequently to the trapezium.

2. "Show how to make a square double a given square."

By constructing a square on the diagonal of the given square.

3. "Show that the diagonals of a parallelogram bisect each other."

Playfair's Euclid ii. Prop. B.

HIGHER BRANCHES OF MATHEMATICS.

SECTION I.

1. Find x from the equation $x^2 - 12x = -35$.
A draper bought a piece of silk for £16 4s., and the number of shillings which he paid per yard was $\frac{4}{5}$ the number of yards. How much did he buy?
2. Find x and y from the equations $x - y = 4$, $x^2 + y^2 = 40$.
There is a rectangular field whose length exceeds its breadth by 16 yards, and it contains 960 yards: find its dimensions.
3. A fast passenger train starts at 20 minutes past 12; it overtakes a luggage train which travels 15 miles an hour, and after having gone 15 miles further overtakes a slow passenger train which travels 20 miles an hour. Another fast train, which travels at the same rate as the first, starts from the same station at 2 o'clock of that day, overtakes the luggage train, and, after having gone 65 miles further overtakes the slow train also, and finds that it has then travelled 120 miles. Required the rate at which the fast trains travel.

SECTION II.

1. Prove the formula for finding the sum of an arithmetical series.

The first term of an arithmetical progression is 1 ; the common difference, 1 ; the sum of the series, 36. Required, the number of terms.

2. When are quantities said to be proportional ? And when is one quantity said to vary as another ?
Prove that, if $a : b :: c : d$; then $a : a \sim b :: c : c \sim d$.
3. Find the number of different combinations that may be made of n different things, taking r of them together.

SECTION III.

1. In a circle the angle in a semicircle is a right angle, but the angle in a segment greater than a semicircle is less than a right angle, and the angle in a segment less than a semicircle is greater than a right angle.
2. Describe a circle in a given triangle.
3. Similar triangles are to each other in the duplicate ratio of their homologous (or corresponding) sides, Prove this, and indicate the steps of the proof of the corresponding proposition for all similar figures.

SECTION IV.

1. Define the sine and the tangent of an angle. What are the values of $\sin. 90^\circ$, $\tan. 180^\circ$, and $\tan. 45^\circ$. Prove that $\cos. 2A = 2 \cos. A - 1 = 1 - 2 \sin. A$.
2. Having given one side of a right-angled triangle and the angle adjacent to that side, show by what calculations the other parts of the triangle may be obtained.
3. Write down the expression for the cosine of an angle of a triangle in terms of the sides ; and prove the expression for the sine of an angle, and for the area of the triangle, in terms of the sides.

What is the logarithm of a number? What are the properties of logarithms on which the utility of logarithmic tables depends?

SECTION V.

1. Prove the expressions for the circumference and area of a circle in terms of its radius.
2. Show that the solid content of any cone, or pyramid, is found by multiplying the area of its base by one-third its height.

SECTION I.

1. "Find x from the equation $x^2 - 12x = -35$(a)

"A draper bought a piece of silk for £16 4s., and the number of shillings which he paid per yard was $\frac{4}{9}$ the number of yards. How much did he buy?" (b)

(a).... $x^2 - 12x = -35$; completing the square we get
 $x^2 - 12x + 36 = 36 - 35 = 1$

And $x - 6 = \sqrt{1} = \pm 1$

$\therefore x = 6 \pm 1 = 7 \text{ or } 5.$

(b) Let x = number of yards; $\therefore \frac{324}{x} =$ price per yard in shillings. But by the question this is equal to $\frac{4x}{9}$.

Hence $\frac{4x}{9} = \frac{324}{x}$

And $4x^2 = 324 \times 9$

$x^2 = 81 \times 9$

$x = 9 \times 3 = 27$

2. (a) "Find x and y from the equations $x - y = 4$, $x^2 + y^2 = 40$.

(b) "There is a rectangular field whose length exceeds its breadth by 16 yards, and it contains 960 yards; find its dimensions."

(a) Squaring the first we get $x^2 - 2xy + y^2 = 16$; subtracting the second

$$- 2xy = - 24$$

$$\therefore 2xy = 24 \quad \text{Add the second.}$$

$$x^2 + 2xy + y^2 = 40 + 24 = 64$$

$$x + y = 8$$

$$\text{And } x - y = 4$$

$$\text{Hence } 2x = 12 \text{ and } x = 6$$

$$2y = 4 \text{ and } y = 2$$

(b) Let x = breadth, whence $x + 16$ = length.

$$\text{But } x(x + 16) = 960$$

$$x^2 + 16x = 960$$

$$x^2 + 16x + 64 = 1024$$

$$x + 8 = \pm 32$$

$$\therefore x = \pm 32 - 8 = 24 \text{ or } -40.$$

The plus sign being taken, 24 is the breadth, and $24 + 16 = 40$, the length.

3. "A fast passenger train starts at 20 minutes past 12; it overtakes a luggage train, which travels 15 miles an hour, and after having gone 15 miles further overtakes a slow passenger train which travels 20 miles an hour. Another fast train, which travels at the same rate as the first, starts from the same station at 2 o'clock of that day, overtakes the luggage train, and, after having gone 65 miles further overtakes the slow train also, and finds that it has then travelled 120 miles. Required the rate at which the fast trains travel."

Let x = rate per hour of the fast trains: now the former starts one hour and two-thirds before the second; therefore that time will elapse before the second comes to the point at which the first overtook the luggage train. We shall deduce our data from the consideration of this as a starting point.

Let us first find, in terms of x , how far the slow passenger train was in advance when the luggage train was overtaken.

Let y = that distance in miles.

The space travelled over by the first train after passing the luggage, and before overtaking the passenger train, was 15 miles: therefore y miles, plus the miles travelled from the time the fast train passed the luggage to the time of coming up with the passenger train, are equal to 15 miles. Now the first train travelled x miles per hour, and the slow 20 miles. Hence, the sum of the following series equals 15 miles.

$$S = y + y \times \frac{20}{x} + y \times \left(\frac{20}{x}\right)^2 + \&c. \text{ ad infinitum}$$

By the summation of this series, we obtain

$$S = \frac{xy}{x-20} \text{ which equals 15}$$

$$\therefore y = \frac{15x-300}{x}$$

Now, the luggage train travels 15 miles per hour. Hence, by the time the second fast train arrives at the point at which the first overtook the luggage train, this last will have travelled $\frac{5}{3} \times 15 = 25$ miles: and the

slow passenger train $\frac{5}{3} \times 20 = \frac{100}{3}$ miles. We obtain

the distance of the fast train's point of junction with these two trains from the termination of two respective series similar to the preceding:

$$S = \frac{25x}{x-15} \text{ in the first case}$$

$$S = \frac{145x-900}{3x-60} \text{ in the other.}$$

But from the question the difference of the distance represented by these expressions equals 65 miles.

$$\therefore \frac{145x - 900}{3x - 60} - \frac{25x}{x - 15} = 65.$$

Simplifying this equation in the usual manner, we obtain

$$x^2 - 42x = -360$$

Solving this quadratic and taking the positive value of the root, we find, $x = 30$

N.B.—The length of the whole journey, 120 miles, does not enter into the solution. It will now merely serve to verify the result, and to indicate that the first fast train travelled 5 miles before it came up with the luggage train.

SECTION II.

1. "Prove the formula for finding the sum of an arithmetical series. (a)

"The first term of an arithmetical progression is 1; the common difference, 1; the sum of the series, 36. Required the number of terms." (b)

(a) Let a = first term and d = common difference.

Now the 2nd term = 1st term + $d = a + d$

„ 3rd term = 2nd term + $d = a + 2d$

„ 4th term = 3rd term + $d = a + 3d$

* * * * *

„ n th term = $(n-1)$ th term + $d = a + \overline{n-1} \cdot d$

Now S , the sum of the series, is equal to all these terms put together; or,

$$S = a + (a + d) + (a + 2d) + (a + 3d) + \dots + (a + \overline{n-1} \cdot d)$$

This series may be written in an inverse order; thus,

$$S = (a + \overline{n-1} \cdot d) + \dots + (a + 3d) + (a + 2d) + (a + d) + a.$$

And now the addition of any two terms that are vertically opposite in the series, will give $(2a + \overline{n-1} \cdot d)$. For the sum of the first terms in each line this is sufficiently evident; the second term in the second line is d

less than the preceding term; that is, it is $(a + \overline{n-2}.d)$. This added to $(a + d)$ the second term of the first line $= (2a + \overline{n-1}.d)$. The third term of the second line is $(a + \overline{n-3}.d)$; the third term of the first line is $(a + 2d)$; the sum of these is $(2a + \overline{n-1}.d)$, as before. The quantity $(2a + \overline{n-1}.d)$ is repeated as many times as there are terms in the progression, that is n times in the present case. Hence, by adding the corresponding term of each line, we get

$$2S = (2a + \overline{n-1}.d) + (2a + \overline{n-1}.d) + \&c. \text{ to } n \text{ terms}$$

$$2S = (2a + \overline{n-1}.d) n$$

$$\therefore S = (2a + \overline{n-1}.d) \frac{n}{2} \dots (1)$$

$$= (a + a + \overline{n-1}.d) \frac{n}{2} \dots (2)$$

$$= (a + l) \frac{n}{2}; \text{ where } l \text{ is the last term of the series,}$$

and is equal to the first term, a , plus the common difference multiplied by the number of its place in the series less by one.

(b) In the example given $S = 36$; $a = 1$; $d = 1$; and n is to be found. Since l is not given, formula (1) will be most convenient.

$$36 = (2 \times 1 + \overline{n-1} \times 1) \frac{n}{2}$$

$$72 = (2 + \overline{n-1}) n$$

$$= 2n + n^2 - n = n^2 + n$$

$$n^2 + n = 72$$

$$n^2 + n + \frac{1}{4} = 72\frac{1}{4} = \frac{289}{4}$$

$$n + \frac{1}{2} = \pm \frac{17}{2}$$

$$n = \pm \frac{17}{2} - \frac{1}{2} = 8 \text{ or } -9$$

- 2 (a) "When are quantities said to be proportional?
 (b) and when is one quantity said to vary as another?
 (c) Prove that if $a : b :: c : d$; then $a : a \sim b :: c : c \sim d$."

(a) When the ratio between two quantities a, b , is the same as between two other quantities c, d ; or when $a \div b = c \div d$ the four quantities form a proportion which is written $a : b :: c : d$, in which a is the same multiple, part, or parts of b , that c is of d .—(b). One quantity x , varies as another quantity y , when the magnitude of x depends on that of y . Thus, if x be the length and y the breadth of a parallelogram, and it be required to construct a *similar parallelogram*, having a given ratio to the first, x varies as y , or the length and breadth increase or diminish simultaneously. If a parallelogram be required equal in area but of different length from another parallelogram; then, as the length increases, the breadth diminishes, and the converse. In this case x *varies inversely* as y .

- (c) Since $a : b :: c : d$

$$\frac{a}{b} = \frac{c}{d} \text{ and } \frac{a}{b} \pm 1 = \frac{c}{d} \pm 1$$

$$\frac{a \pm b}{b} = \frac{c \pm d}{d}$$

And $\frac{b}{a} = \frac{d}{c}$

$$\therefore \frac{a \pm b}{b} \times \frac{b}{a} = \frac{c \pm d}{d} \times \frac{d}{c}$$

$$\text{or, } \frac{a \pm b}{a} = \frac{c \pm d}{c}$$

that is, $a \pm b : a :: c \pm d : c$

or, inversely, $a : a \pm b :: c : c \pm d \dots (1)$

Again $\frac{b}{a} = \frac{d}{c}$

$$\text{And} \quad \frac{b}{a} \pm 1 = \frac{d}{c} \pm 1$$

$$\therefore \frac{b \pm a}{a} = \frac{d \pm c}{c}$$

$$\text{Whence } b \pm a : a :: d \pm c : c$$

$$\text{And inversely } a : b \pm a :: c : d \pm c \dots (2)$$

$$\text{But } a : a \pm b :: c : c \pm d$$

$$\therefore a : a \sim b :: c : c \sim d.$$

3. "Find the number of different combinations that may be made of n different things taking r of them together."

Of n different objects, a, b, c, d , &c., a may be placed before each of the rest and thus form $n-1$ permutations in which a stands first; there may similarly be $n-1$ permutations in which b stands first; and the same for each of the n different objects; so that there are $n(n-1)$ permutations of objects taken two and two. (1) If from the n things the first be taken away there will remain $n-1$ things; and the number of permutations that can be formed of them, taken two and two, will be $(n-1)(n-2)$. Now let the object a which we have assumed to be taken from the n things be prefixed to each of the permutations $(n-1)(n-2)$, and there will be $(n-1)(n-2)$ such permutations taken three together, in which a stands first; there will be as many in which b stands first, and so on for the rest; so that, on the whole,

$n(n-1)(n-2)$ = number of permutations of n different things taken three together.

We thus perceive that the number of permutations of n things taken

two together .. $n(n-1)$

three together .. $n(n-1)(n-2)$

Similarly it is shown,

$$\begin{aligned}
 &\text{four together} \dots n (n-1) (n-2) (n-3) \\
 &\text{five together} \dots n (n-1) (n-2) (n-3) (n-4) \\
 &\quad * \quad * \quad * \quad * \quad * \quad * \quad * \quad * \quad * \\
 &r \text{ together} = n (n-1) (n-2) (n-3) (n-4) (n-5) \\
 &\dots (n-r-1) \\
 &\quad = n (n-1) (n-2) (n-3) \dots (n-r+1)
 \end{aligned}$$

For each combination of things taken two and two there are twice as many permutations; for each combination, as $a b$, admits of two permutations $b a, a b$. Hence the permutations of things taken two and two must be divided by two to give the combinations of the same objects; or the number of combinations of n

$$\text{things taken two and two together} \dots \frac{n (n-1)}{2}.$$

There are $n (n-1) (n-2)$ permutations of n things taken three and three together, and each combination of three admits $3 \times 2 \times 1$ permutations, so that the permutations must be divided by $3 \times 2 \times 1$ to give the combinations; that is, the number of combinations of n things taken three and three, is

$$\begin{aligned}
 &\frac{n (n-1) (n-2)}{1 \cdot 2 \cdot 3} \\
 \text{taken four together} &= \frac{n (n-1) (n-2) (n-3)}{1 \cdot 2 \cdot 3 \cdot 4}.
 \end{aligned}$$

And similarly the number of combinations of n things taken r times together

$$= \frac{n (n-1) (n-2) (n-3) \dots (n-r+1)}{1 \cdot 2 \cdot 3 \cdot 4 \dots r}$$

Example; required the number of parties of three that may be formed out of six persons.

Here $n = 6$ and $r = 3$

$$\text{So that } \frac{n (n-1) (n-2)}{1 \cdot 2 \cdot 3} = \frac{6 \times 5 \times 4}{1 \cdot 2 \cdot 3} = 20.$$

SECTION III.

1. "In a circle the angle in a semicircle is a right

angle, but the angle in a segment greater than a semicircle is less than a right angle, and the angle in a segment less than a semicircle is greater than a right angle."

See Euclid iii. 31.

2. "Describe a circle in a given triangle."

See Euclid iv. 4. Tate's Geometry and Mensuration, Art. 69.

3. "Similar triangles are to each other in the duplicate ratio of their homologous (or corresponding) sides. Prove this, and indicate the steps of the proof of the corresponding proportion for all similar figures."

See Euclid vi. 19. Tate, Art. 55. Geometry.

The first step in the proof of the proposition that similar figures are to one another in the duplicate ratio of their corresponding sides, is to divide the similar figures into similar triangles and show that they are similar; secondly, the corresponding triangles of each polygon being proved similar and consequently in the duplicate ratio of their homologous sides—to show that *collectively*, the triangles are in the same ratio that they were proved to be in *severally*. But the triangles collectively are the polygons individually; hence similar polygons are to one another as the squares of their like sides.

SECTION IV.

1. (a) "Define the sine and the tangent of an angle.

(b) "What are the values of $\sin. 90^\circ$, $\tan. 180^\circ$, and $\tan. 45^\circ$?

(c) "Prove that $\cos. 2A = 2 \cos.^2 A - 1 = 1 - 2 \sin.^2 A$."

(a) The sine of an arc (which is the measure of an angle) is the perpendicular let fall from one extremity of that arc upon the radius passing through the other extremity. The tangent of an arc (or of an angle) is the straight line which touches the circle at one end of the arc, at right angles with the radius that passes

through the point where the tangent touches the arc, and is terminated by the radius produced through the other end of the arc.

(b) $\text{Sin. } 90^\circ = \text{radius or } 1$, according to the standard of trigonometrical measurement.

$\text{Tan. } 180^\circ = 0$; $\text{tan. } 45^\circ = \text{radius or } 1$.

(c) The reply to this part of the question requires, as a preliminary step, either to prove or to assume one of the fundamental formulæ of analytical trigonometry.

For the sake of conciseness, and to dispense with the necessity of a figure, we adopt the latter course.

The formula from which the expression in the question may be most directly deduced is,

$$\cos. (A + B) = \cos. A. \cos. B - \sin. A. \sin. B.$$

In this formula, suppose $B = A$; then

$$\cos. (A + A) = \cos. A. \cos. A - \sin. A. \sin. A.$$

$$\therefore \cos. 2 A = \cos.^2 A - \sin.^2 A. \dots (1)$$

In any right-angled triangle the sides which contain the right angle are respectively the sine and cosine of one of the acute angles, the hypotenuse being radius. In trigonometrical calculations radius is taken unity.

$$\text{Hence by Euclid i. 47. } \sin.^2 + \cos.^2 = 1, \text{ and} \\ \sin.^2 = 1 - \cos.^2$$

Adopting this value of $\sin.^2 A$ in formula (1) we get,

$$\cos. 2 A = \cos.^2 A - (1 - \cos.^2 A) = \cos.^2 A - 1 \\ + \cos.^2 A = 2 \cos.^2 A - 1. \dots (2)$$

Also, $\cos.^2 = 1 - \sin.^2$; substituting this in (2)

$$\cos. 2 A = 1 - 2 \sin.^2 A$$

$$\therefore \cos. 2 A = 2 \cos.^2 A - 1 = 1 - 2 \sin.^2 A.$$

2. "Having given one side of a right-angled triangle and the angle adjacent to that side, show by what calculations the other parts of the triangle may be found."

1st. Since the three angles of a triangle equal 180, and the given triangle is right angled, the remaining two angles = 90° ; so that one of them being given

the other is obtained by subtracting the known one from 90° .

2nd. If the given side be the hypotenuse, multiply it by the sine of the adjacent angle, and the product will be the side opposite the angle whose sine is used: multiply it by the cosine of the same angle and the product will be the side adjacent to the angle.

3rd. If one of the other sides is given, divide it by the sine of the adjacent angle, the quotient will be the opposite side: divide it by the cosine of the same angle, the quotient will be the adjacent side. These results are evident from the definition of the sine, cosine, and tangent of an angle. See Hymer's Trigonometry, page 53. Hall's and Snowball's are most valuable text-books. Tate's compendious summary of trigonometry, in his Geometry and Mensuration, will be found of great utility as a first course in this department of mathematical science.

3. (a) "Write down the expression for the cosine of an angle of a triangle in terms of the sides and prove the expression for the sine of an angle and for the area of a triangle, in terms of the sides.

(b) "What is the logarithm of a number? What are the properties of logarithms on which the utility of logarithmic tables depends?"

If A, B, C, be the angles of a triangle, and a, b, c , the sides of the same; then,

$$\text{Cos. A} = \frac{b^2 + c^2 - a^2}{2bc}$$

$$\text{Cos. B} = \frac{a^2 + c^2 - b^2}{2ac}$$

$$\text{Cos. C} = \frac{a^2 + b^2 - c^2}{2ab}$$

In the triangles A B C, let fall the perpendiculars C D,

in the one case within, and in the other without, the triangle upon the base and the base extended.

(The triangles will be readily constructed; or, see Snowball's Trigonometry, page 70, figures 1, 2, and 3, reversing the positions of A and B.)

Let the three angles of each triangle be indicated by the letters A, B, C, and the sides opposite them by a, b, c .

From the first triangle we have,

$$a^2 = b^2 + c^2 - 2AB \cos A \quad (\text{Euc. ii. 13})$$

$$\text{But } AD = b \times \cos A$$

$$\therefore a^2 = b^2 + c^2 - 2bc \cos A$$

also from the second,

$$a^2 = b^2 + c^2 + 2AB \cos A \quad (\text{Euc. ii. 12})$$

$$\text{But } AD = b \times \cos C \quad AD = -b \times \cos C$$

$$= -b \times \cos A$$

$$\therefore a^2 = b^2 + c^2 - 2bc \cos A, \text{ as before.}$$

From each of these expressions we have,

$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

In Section iv. 1, it was shown that

$$\cos 2A = 1 - 2 \sin^2 A$$

If for $2A$ we put A , and for A , $\frac{A}{2}$, then

$$\cos A = 1 - 2 \sin^2 \frac{A}{2}$$

Substituting this value of $\cos A$,

$$1 - 2 \sin^2 \frac{A}{2} = \frac{b^2 + c^2 - a^2}{2bc}$$

$$\therefore 2 \sin^2 \frac{A}{2} = 1 - \frac{b^2 + c^2 - a^2}{2bc}$$

$$= \frac{a^2 - b^2 - c^2 + bc}{2bc} = \frac{a^2 - (b-c)^2}{2bc}$$

$$= \frac{(a+b-c)(a-b+c)}{2bc}$$

$$\therefore \sin. \frac{A}{2} = \frac{(a+b-c)(a-b+c)}{4bc}$$

$$\therefore \sin. \frac{A}{2} = \frac{\sqrt{(a+b-c)(a-b+c)}}{4bc}$$

This expression is further simplified by putting $S = \frac{a+b+c}{2}$ = half the sum of the sides.

$$\text{And } 2S = a+b+c$$

$$\therefore a+b-c = 2(S-c) \text{ and } a-b+c = 2(S-b)$$

$$\therefore \sin. \frac{A}{2} = \frac{\sqrt{(S-b)(S-c)}}{bc} \dots (1)$$

In a similar manner it is shown that

$$\cos. \frac{A}{2} = \pm \frac{\sqrt{S(S-a)}}{bc} \dots (2)$$

Multiply (1) by twice (2)

$$2 \cos. \frac{A}{2} \sin. \frac{A}{2} = \frac{2}{bc} \sqrt{S(S-a)(S-b)(S-c)}$$

$$\text{But } \sin. A = 2 \sin. \frac{A}{2} \cos. \frac{A}{2}$$

$$\therefore \sin. A = \frac{2}{bc} \sqrt{S(S-a)(S-b)(S-c)} \dots (3)$$

Again, area $ABC = \frac{1}{2} AB \times CD = \frac{1}{2} c \times b \times \sin. A$

For $\sin. A$ substitute its value (3)

$$\begin{aligned} \therefore \text{area} &= \frac{1}{2} cb \times \frac{2}{bc} \sqrt{S(S-a)(S-b)(S-c)} \\ &= \sqrt{S(S-a)(S-b)(S-c)} \end{aligned}$$

(b) The logarithm of a number to any assumed base, is the quantity expressing the power to which that base must be raised to produce the given number. The base most generally adopted is 10, so that the logarithms of numbers given in our tables are the powers to which 10 must be raised to produce these numbers.

Thus the logarithm of 100 is 2, as $10^2 = 100$; the log. of 1000 = 3, since $10^3 = 1000$; the log. of numbers between 100 and 1000 is 2 plus a fraction; the log. of numbers between 10 and 100 is 1 plus a fraction; the log. of numbers between 10 and 1 is some fractional quantity less than 1. The properties of logarithms of greatest practical utility in calculation are—1st. The logarithm of a product is equal to the sum of the logarithms of its factors; so that to multiply numbers we have only to add their logarithms and the number corresponding to the sum of their logarithms will be the product of the numbers. 2nd. To divide one number by another we have only to deduct the log. of the divisor from that of the dividend.

3rd. The logarithm of any power of a number is equal to the product of the logarithm of the number by the index of the power.—4th. The logarithm of the root of any quantity is equal to the logarithm of the quantity divided by the index of the root.

Hence, if we have to multiply one number by another, or to divide one by the other, we have only to add or subtract their logarithms: in the tables corresponding to the sum or difference of logarithms thus obtained are the product or quotient required. Or if we wish to get any power or root of a number we multiply or divide its logarithm by the index of the given power or root and the number corresponding to the logarithms thus resulting are the power or root required. So that addition of logarithms is multiplication in common arithmetic; subtraction is division; multiplication is involution; and division is the extraction of roots.

SECTION V.

1. "Prove the expression for the circumference and area of a circle in terms of its radius."

See Playfair's Euclid, Supplement, Book i. Propositions 5 and 9; also Tate's Geometry, Theorems 72, 76.

2. "Show that the solid content of any cone, or pyramid is found by multiplying the area of its base by one third of its height."

See Playfair's Euclid, Sup. Book iii. 15 and 18. Tate's Geometry, Theorems, 91, 92.

MECHANICS.

SECTION I.

1. Define the unit of *work*, and show that if a pressure of m pounds be exerted over a space of n feet, the number of units of work done is represented by $m \times n$.
2. A locomotive engine working at 40 H.P. ascends an incline of 1 in 250 steadily at the rate of 25 miles per hour; what is the weight of the train?
3. The traction of a waggon upon a level road is $\frac{1\text{th}}{m}$ of the gross load W ; there is an ascent on this road of 1 in n ; show that if the friction on the ascent be supposed the same as that on the level, the traction P up it is represented by the formula

$$P = W \left(\frac{1}{m} + \frac{1}{n} \right).$$

SECTION II.

1. There is a fall upon a stream of 11 feet, down which 22400 lbs. of water descend per minute, and on which there is erected a water-wheel whose modulus is .6; what is its horse power?
2. A well 100 feet deep and 5 feet in diameter is to be deepened 30 feet. Two men are employed at the bottom. The material is such that four times as much time is employed in the use of the pick as

of the shovel. Supposing that each man could, when using the shovel alone, throw out 400 cubic feet into the vessel which conveys it to the surface in one day, how long would they be in completing the work ?

3. Three men undertake to pump out the water from a shaft a feet in depth, working in succession : how must they divide the work that each may do an equal share of it ?

SECTION III.

1. What must be the length of the stroke of the piston of an engine whose area is 1000 square inches, that, making 20 single strokes per minute under a mean effective pressure of 15 lbs. per square inch, the engine may yield 10 H.P. after one-fifth of the work done on the piston has been lost by friction ?
2. State concisely the method by which the number of units of work done per stroke upon each square inch of the piston of an engine may be determined when the steam is worked expansively.
3. Investigate an expression for the work accumulated in a body of a given weight moving with a given velocity.
4. A train which weighs 400 tons is travelling at the rate of 20 miles an hour ; what friction must be put upon it by the breaks, in addition to the friction of the rail, that it may be brought to rest within the space of 200 yards, the steam being thrown off ?

SECTION IV.

1. State concisely the statical principle of the equality of moments, and describe a method of proving it by experiment.

2. Investigate an expression for the velocity acquired by a body falling by gravity freely through a given space.
 3. Show how it may be determined whether a pillar will stand or fall, when any given pressure is applied obliquely to its summit.
 4. Show generally how the traction of a body up an inclined plane, subject to friction, may be determined, and investigate the direction of least traction.
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SECTION I.

1. (1) "Define the unit of *work*, (2) and show that if a pressure of m lbs. be exerted over a space of n feet, the number of units of work done is represented by $m \times n$."

(1) The unit of work is the labour requisite to raise one pound to the height of one foot, or an equivalent amount of force however applied.

(2) Hence, if the number of lbs. raised be represented by 1, 2, 3, m , the units of work done in raising the weight 1 foot will be 1, 2, 3, m respectively.

As m indicates the number of units of work performed in raising m lbs. one foot high; the number necessary to raise m lbs. to the height of 2, 3, n ft. will be 2 m , 3 m $n \times m$ respectively. Therefore the work done in raising m lbs. over n ft. is represented by $n \times m$, or $m \times n$.

2. "A locomotive engine working at 40 H.P. ascends an incline of 1 in 250 steadily at the rate of 25 miles per hour; what is the weight of the train?"

$40 \times 33000 =$ units of work done by engine per minute.

$\frac{25 \times 5280}{60} =$ distance in feet passed over per minute.

$\frac{25 \times 5280 \times 1}{60 \times 250} =$ height in feet the train is raised per minute.

A force of 7 lbs. is usually required to move a ton on a level rail; therefore the work done per minute upon each ton of the train will be $\frac{25 \times 5280 \times 7}{60} + \frac{25 \times 5280 \times 2240}{60 \times 250} = \left(7 + \frac{224}{25}\right) \times \frac{25 \times 5280}{60} = 399 + 88.$

$\therefore \frac{40 \times 33000}{399 \times 88} = 37.6 =$ the weight of the train in tons.

See Appendix i. Mechanics, Question 2.

3. "The traction of a waggon upon a level road is $1-m$ th of the gross load W ; there is an ascent on this of 1 in n ; show that if the friction on the ascent be supposed the same as that on the level, the traction P up it is represented by the formula

$$P = W \left(\frac{1}{m} + \frac{1}{n} \right).$$

The traction, or force, applied to move the load over the space of one foot, is equal to the power that would have to be applied in order to raise $1-m$ th of the load one foot.

$$\therefore \frac{W}{m} = \text{traction due to friction.}$$

Now during the time the waggon is passing over n feet it is raised 1 foot; $\frac{1}{n}$, therefore, is the height to which the load is raised while passing over one foot.

$$\therefore W \times \frac{1}{n} = \frac{W}{n} = \text{traction due to gravity.}$$

$$\text{Hence } \frac{W}{m} + \frac{W}{n} = W \left(\frac{1}{m} + \frac{1}{n} \right) = P.$$

SECTION II.

1. "There is a fall upon a stream of 11 feet, down which 22400 lbs. of water descend per minute, and on which there is erected a water-wheel whose modulus is .6; what is its horse power?"

$22400 \times 11 =$ units of work done per minute by the descent of the water. But this work is applied to a machine by the imperfection of whose working a part of the work applied is lost; the effective part being .6.

$$\therefore 22400 \times 11 \times .6 = \text{effective work done.}$$

$$\text{And } \frac{22400 \times 11 \times .6}{33000} = 4.48 = \text{H.P.}$$

2. "A well 100 feet deep, and 5 feet in diameter is to be deepened 30 feet. Two men are employed at the bottom. The material is such that four times as much time is employed in the use of the pick as of the shovel. Supposing that each man could, when using the shovel alone, throw out 400 cubic feet into the vessel which conveys it to the surface in one day, how long would they be completing the work?"

$$5^3 \times .7854 \times 30 = \text{number of cubic feet of material to be removed.}$$

Now one man could throw out 400 cubic feet per day ; two men would do twice that work ; but 4—5ths of their time is employed in picking, leaving 1—5th for shovelling :

$\therefore \frac{400 \times 2}{5} =$ cubic feet of material shovelled out per day.

Hence $\frac{25 \times 30 \times 5 \times \cdot 7854}{400 \times 2} = 3\cdot68 =$ number of days required.

3. "Three men undertake to pump out the water from a shaft a feet in depth, working in succession : how must they divide the work that each may do an equal part of it ? "

Let $x =$ No. feet of water in depth raised by the 1st.

$y =$ " " " " " " 2nd.

$z =$ " " " " " " 3rd.

Now, as the whole body of water raised by each may be considered raised from the centre of gravity of each respective portion the distance through which each must raise that portion will be,

$$\frac{x}{2}; x + \frac{y}{2}; a - \frac{z}{2} \text{ respectively.}$$

As each of the men is to do the same amount of work, it follows, that these quantities, when multiplied by x, y, z , respectively, will be equal ; i.e.

$$\frac{x^2}{2} = xy + \frac{y^2}{2} = az - \frac{z^2}{2}$$

Further, it is evident that the work performed in raising the water thus in three portions must be equivalent to the work done supposing the whole of the water to be raised *en masse* from the depth of its centre of gravity, $\frac{a}{2}$

$\therefore \frac{a^2}{2}$ = the sum of the three equal expressions, above, and $\frac{a^2}{2 \times 3}$ = part of each separately.

Hence, $\frac{x^2}{2} = \frac{a^2}{6}$; $xy + \frac{y^2}{2} = \frac{a^2}{6}$; $az - \frac{z^2}{2} = \frac{a^2}{6}$; from which we find $x = \frac{a}{\sqrt{3}}$; $y = \frac{\sqrt{2}a^2}{3} - \frac{a}{\sqrt{3}} = \frac{\sqrt{2}-1}{\sqrt{3}}a$; $z = a \pm a \frac{\sqrt{2}}{3} = a \left(1 - \frac{\sqrt{2}}{3}\right)$

It should be remarked, that the minus sign of the quantity obtained, after taking the square root for the value of z , is taken to get that value; because we worked from the bottom in the last case (z).

SECTION III.

1. "What must be the length of the stroke of the piston of an engine whose area is 1000 square inches, that, making 20 single strokes per minute under a mean effective pressure of 15 lbs. per square inch, the engine may yield 10 H.P.?"

$\frac{10 \times 33000}{20}$ = the units of work done per stroke.

$1000 \times 15 \times \frac{4}{5}$ = effective units of work done through one foot.

$\therefore \frac{10 \times 33000 \times 5}{20 \times 1000 \times 15 \times 4} = 1.375$ feet, length of stroke.

2. "State concisely the method by which the number of units of work done per stroke upon each square inch of the piston of the engine may be determined when the steam is working expansively."

Let the stroke from the point at which the steam is cut off be considered as divided into any number of equal parts; find the pressure of the steam upon one inch of the piston at these points by "Marriotte's law;" and let the units of such pressure be transferred to length by ordinates drawn upon a straight base, at a distance from each other equal to the length of the portions of the stroke; join the other extremities of the ordinates, and a figure will be formed whose area represents the work performed upon one inch of the piston during the expansive working of the steam; which work may be found by the application of "Thomas Simpson's rule." Add to this the work done upon one inch before the steam is cut off; the result will be the work done upon one square inch of the piston during one stroke when the steam is worked expansively. See Appendix i., Mechanics, Ques. 3.

3. "Investigate an expression for the work accumulated in a body of a given weight moving with a given velocity."

Let W = the given weight; and V = the given velocity.

In order to find the accumulated work of the weight W , when it has acquired the velocity V , we may consider it as having fallen freely from the requisite height to produce that velocity. This height, or space in feet when found, multiplied by W will obviously give the accumulated work; in the same manner as $16\frac{1}{2}$ units are accumulated by the falling of a weight of one pound $16\frac{1}{2}$ feet, at the end of which the acquired velocity is $32\frac{1}{2}$.

From Ques. 2. Section iv. we obtain,

$$S = \frac{V^2}{2 \times 32\frac{1}{2}}$$

By multiplying this space by W in lbs. the accumulated units of work are obtained.

$U = \frac{V^2 \times W}{2g}$, in which g is the constant quantity 32½.

4. "A train which weighs 400 tons is travelling at the rate of 20 miles an hour; what friction must be put upon it by the breaks, in addition to the friction of the rail, that it may be brought to rest within the space of 200 yards, the steam being thrown off?"

$$\text{In this case } V = \frac{20 \times 5280}{60 \times 60} = \frac{88}{3}$$

$$\therefore U = \frac{88^2 \times 400 \times 2240}{9 \times 2 \times 32\frac{1}{2}} = 11860895.7$$

Now the work absorbed by the usual friction over the space of 200 yards will be

$$400 \times 7 \times 200 \times 3 = 168000$$

By taking this from the previous result, the whole work due to additional friction will be obtained.

$$\therefore \frac{11860895.7 - 1680000}{200 \times 3} = 16968.95 \text{ units of}$$

work.

This work of additional friction is distributed over the whole train of 400 tons. If the friction per ton be required, the operation is obvious.

SECTION IV.

1. "State consisely the statical principle of equality of moments, and describe a method of proving it by experiment."

When two forces acting in opposition to each other, are such in combined magnitude and direction as reciprocally to neutralize their effects, there is said to be

an *equality of moments*. Thus, in a lever of the first kind, let F represent the position of the fulcrum, A and B, the extremity of the long and the short arm respectively, W the weight and P the power in the same units of weight as W. Then the statical principle of the equality of moments is expressed by the equation $P \times A F = W \times B F$: or, in words, a force multiplied by the distance from its centre of action is equal to an opposing force multiplied by its distance from the same point, when equilibrium takes place; i.e., the moments on each side are equal. The term moments is a modification of *momentum*; and the effects which these terms indicate, when closely compared, bear a striking analogy to each other:—the momentum of a body is its weight, or quantity of matter, multiplied by its quantity of motion. Now the arms of the lever, in length, are to each other as the arcs described by their extremity; therefore, if C and c be substituted for the lengths of those respective arcs, the above equation will become $P \times C = W c$.

The resemblance between these moments and the momentum of a body will readily suggest itself. A method of proving the principle by experiment will be found in "Tate's Mechanics," Page 64. But the principle could be verified by the lever, by taking into consideration the weight of the arms and thus producing a compound power and weight; the former composed of P acting at the distance of the extremity of the long arm *plus* the weight of that arm acting at the distance of half its length, and the latter, of W acting at its previous distance *plus* the weight of the short arm acting at the distance of half its length.

NOTE.—It will be understood that we suppose the lever to be of uniform weight throughout its length.

The circular, uniform board, which Mr. Tate recommends for the illustration of the principle is preferable; for, the centre of gravity of the board is at the fulcrum, hence, P and W only need be taken into consideration.

2. "Investigate an expression for the velocity acquired by a body falling by gravity freely through a given space."

When, at the latitude of Greenwich, and near the earth's surface, a body is acted upon directly by the force of gravitation, all opposing forces being excluded, it falls, during the first second of its descent, through a space of 16.0954 feet. This quantity being nearly equal to 16 ft. 1 in., is usually expressed in practice as $16\frac{1}{2}$ ft. Now, the velocity of the falling body during the second must have increased from nothing to such a quantity that the space passed over is $16\frac{1}{2}$ ft. Hence, the acquired velocity at the end of one second will be $2 \times 16\frac{1}{2}$ ft., which is termed the *force of gravity*, for which we shall substitute g .

Now, as the force of gravity is uniform and constant, it necessarily follows that an equal increase of velocity will be acquired by the falling body in equal times; thus, at the end of 1, 2, 3, n sec., the velocity will be g , $2g$, $3g$, ng , or $V = t \times g$ (1)

The space passed over in 1, 2, 3, n sec., will be

$$\begin{array}{rcll}
 \text{During 1st second } 16\frac{1}{2}f, & \text{for which put } f & & \\
 \text{,, 2nd ,, } & 16\frac{1}{2}f + 2 \times 16\frac{1}{2}f = 3f & & \\
 \text{,, 3rd ,, } & 16\frac{1}{2}f + 2 \times 16\frac{1}{2}f + 2 \times 16\frac{1}{2}f & & \\
 = 5f & & & \\
 * & * & * & * & * & * & * & * \\
 \text{,, } n\text{th ,, } & 16\frac{1}{2}f + (n-1) 2 \times 16\frac{1}{2}f & & \\
 = (2n-1)f & & &
 \end{array}$$

Hence the space passed over in n seconds is

$$f + 3f + 5f + \&c. \text{ to } (2n-1)f \dots \dots (a)$$

Let the sum of this series be found

$$\begin{aligned} S &= f + 3f + 5f + \&c. \text{ to } (2n-1)f \\ &= \frac{(2n-1)f + (2n-3)f + \&c. \text{ to } f}{2} \end{aligned}$$

$$\therefore 2S = 2nf + 2nf + \&c. \text{ to } n \text{ terms}$$

$$\text{And } S = \frac{2nf n}{2} = n^2 f$$

The usual form of this equation is,

$$(2) \therefore S = \frac{t^2 \times g}{2}, \text{ in which } t \text{ represents the number of seconds, and } \frac{g}{2} \text{ the } f \text{ or } 16\frac{1}{2}$$

$$\begin{aligned} \text{From equation (1) } t &= \frac{V}{\frac{g}{2}} \\ \text{,, ,, (2) } t &= \left(\frac{2S}{g} \right)^{\frac{1}{2}} \end{aligned} \left. \vphantom{\begin{aligned} \text{From equation (1) } t &= \frac{V}{\frac{g}{2}} \\ \text{,, ,, (2) } t &= \left(\frac{2S}{g} \right)^{\frac{1}{2}} \end{aligned}} \right\} \dots (3)$$

We have now obtained equations from which either the time of the descent of (3), the space passed over by (2), and the acquired velocity of (1), a falling body may be found. Further, it is seen from the expression a , that space passed over by a falling body in any particular second of its descent, is equal to the product of $16\frac{1}{2}$ by twice the number, in the order of that second with unity deducted; or, the spaces passed over in each succeeding second are to each other as the odd numbers, 1, 3, 5, 7, 9, &c.

3. "Show how it may be determined whether a pillar will stand or fall, when any given pressure is applied obliquely to its summit."

With the assistance of a scale of equal parts draw a figure of the pillar, whose stability is to be determined, in such a manner, that not only the relative magnitude of the parts will be correctly delineated, but also that the inaccuracy of perpendicular erection, if any, may

be represented. Then upon a horizontal base erect a perpendicular passing through the point which indicates the centre of gravity of the pillar. Next, from the point at which the overturning force is applied, draw a line in the direction of that force, intersecting the perpendicular from the point of intersection, set off the units of force upon this line produced, and from the same point set off the units of weight in the pillar in the same denomination; complete the parallelogram of forces, and extend the diagonal to the base line. If this diagonal produced cut the horizontal line within the base of the figure, the pillar will stand, and *vice versa*. See Tate's Mechanics, page 111.

4. "Show generally, how the traction of a body up an inclined plane, subject to friction, may be determined, and investigate the direction of least traction."

Chap. VI. of "Moseley's Mechanics Applied to the Arts," and pages 127—129 of Tate's Mechanics, afford a lucid reply to this question. But, in either work, the knowledge of preceding articles is requisite for a right understanding of the one under consideration, and a mere reference to them would not make our solution more complete. We therefore refer the reader to those authorities, from which our reply could only be a transcript.

PHYSICAL SCIENCE.

SECTION I.

1. Mention proofs of the extreme divisibility of matter.
2. What do you understand by *density*? How are the densities of different bodies compared?
3. Explain the use of the terms *heat* and *cold*. What is *latent* heat? What *specific* heat?
How does a thermometer enable us to compare the temperatures of bodies?

SECTION II.

1. Draw a diagram of Bramah's hydrostatic press, and show how to determine the pressure which may be produced by means of it.
2. There is a barge whose section is an equilateral triangle, each side being a feet in length, and whose length is b feet, how deep will it sink in the water; its weight and that of its lading being together w lbs.?
3. Define the centre of pressure of a fluid, and show that the centre of pressure of a rectangular flood-gate is situated at two-thirds the depth.

SECTION III.

1. How does the intensity of the light of a candle vary with the distance of the illuminated surface from the flame? Illustrate your meaning by a numerical comparison in some supposed instance.
2. If a ray of light passes from air into water, what change takes place in its direction, and according

to what law? Under what circumstances is it impossible for a ray to pass out of water into air?

3. Explain the decomposition of light by means of a prism.
4. Show distinctly how it is that a lense may be used, first as a burning-glass, and secondly to correct defective sight.

SECTION IV.

1. What solid substance, and what three gases, form the organic parts of all vegetable and animal substances?
3. Describe the functions of the leaf in plants by night and by day.
3. From considerations founded on a knowledge of the inorganic constituents of plants, account for the fact that one crop will grow where another fails—that mixed crops grow well together—that a rotation of crops is necessary.
4. What is the chemical constitution of lactic acid? What relation does it bear to that of milk of sugar? In what way does the formation of lactic acid determine the separation of curds in milk? How may these be made to disappear, and in what way does the rennet act in cheese making?

SECTION I.

1. "Mention proofs of the extreme divisibility of matter."

A grain of gold can be beaten out so as to occupy a surface of 50 square inches; and this leaf can be divided into half a million of visible parts. 124,500 such leaves would be but one inch in thickness. The particles of light are so infinitely small, that though they impinge on our organs of vision with a velocity of 192,000 miles per second, no sensible inconvenience results. A grain

of cochineal dissolved in three gallons of water, imparts to each drop a colouring matter equal to the one hundred and thirty thousandth part of a grain. A block of talc, less than an inch in thickness, has been divided into more than a million distinct laminæ. Other instances will readily suggest themselves.

2. "What do you understand by density? How are the densities of different bodies compared?"

Density is a relative term used to imply the proportion between the weights of equal bulks of different bodies. Its synonym is Specific Gravity. Distilled water is the usual standard to which the densities, or relative weights of bodies are referred. A cubic inch of distilled water, at the temperature 62° Fahrenheit, and barometrical column of 30 inches, weighs 252.458 Troy grains; 7000 such grains make a pound Avoirdupoise; and a cubic foot of water, 997.136 ounces, or, in round numbers, 1000 ounces. A cubic foot of water considered to weigh 1000 ounces is the unit of volume; and the number of times that 1000 ounces is contained in the weight of a cubic foot of any other substance, expresses the density, or specific gravity of that substance. Thus, a cubic foot of hammered platinum weighs 20,336 ounces, in which 1000 is contained 20.336 times, and this number is the specific gravity of platinum.

3. "Explain the use of the terms *heat* and *cold*. What is *latent heat*? What *specific heat*? How does a thermometer enable us to compare the temperatures of bodies?"

Heat is a universally diffused agency which becomes sensible to us by our bodily sensations and by the changes it produces on all substances; and cold is a term that indicates the sensation felt on the abstraction of heat.

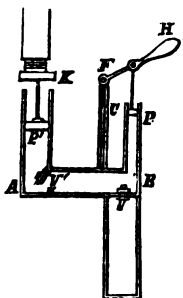
Latent heat is that condition of caloric in which it exists in a state of chemical combination with bodies, without giving any indications of its presence. Sensible heat is that which affects the senses, or more accurately, the thermometer, with an impression of heat or cold. Sensible heat and temperature are convertible terms. The thermometer, like most of the instruments designed to measure an increase or diminution in the heat of bodies, depends for its utility on the general tendency of heat to expand bodies. Certain fluids, as mercury, spirits of wine, &c., expand in almost the same ratio with the increase of their temperatures; so that when a thermometer containing such fluid is immersed in any other fluid, or placed in contact with bodies in general, the properties of *radiation* and *conduction* of heat possessed by bodies cause an equalization in the temperatures of the fluid in the thermometer and the external substance. The particular temperature is registered by the rise of the fluid up a graduated scale to which the tube of the thermometer is attached. The use of this instrument applies only to the manifestations of sensible heat. Latent heat has been estimated, though not with great exactness, by an instrument called the Calorimeter. It depends on the principle that ice cannot subsist at a higher temperature than 32° ; and the amount of ice which can be converted into water of the same temperature with ice by abstraction of heat from equal weights of various substances, is taken as the measure of the latent heat of those substances.

See Turner's Chemistry. Thermometer.

SECTION II.

1. "Draw a diagram of Bramah's hydrostatic press, and show how to determine the pressure which may be produced by means of it.

The Hydrostatic Press is a simple machine, the power of which may be increased to an almost unlimited extent. Its action depends upon that property of fluid bodies, by which, in consequence of the extreme ease with which the particles move among themselves, pressure applied to any point is transmitted equally in all directions.



In the annexed diagram, A B is a pipe connecting the cylinders N A, and C B, and passing to a well, or cistern, which supplies the water necessary to work the machine; V and V', are two valves opening towards the left; P is a solid piston working in the cylinder C B, and to which motion is communicated by means of the handle or lever F H; P' is a piston moving in N A, and to which is attached the press-board K.

Let us now trace the motion of the different parts of the engine. Suppose an upward stroke to be made by P; then the pressure being removed from A B C, the valve V' will be shut, and the water from the reservoir will force open the valve V and fill up the void created by the ascent of P. On the contrary, when a downward stroke is made, the valve V will close; and the pressure in C B A exceeding that in N A, the valve V' will be opened and water forced into the larger cylinder. This will necessarily raise P K, and it may be readily conceived, that by a fixed board above K, any materials placed between them may be compressed to any extent, limited only by the power of the engine and the strength of its parts.

To calculate the power gained by the hydrostatic press. Let D and d be put respectively for the diameters of P' and P.

From the nature of a fluid any pressure on P will be transmitted to P'; and as such pressure is propagated equally in all directions, the pressure upwards on any portion of P' is equal to the force applied to an equal portion of P, in the opposite direction.

$$\therefore \text{Power gained} = \frac{\text{Area } P'}{\text{Area } P} = \frac{D^2}{d^2}$$

The same result may be obtained on the principle of virtual velocities. Suppose one stroke to be made by the piston, and let the length be 1 or unity; also let x = the height to which the larger piston is raised by the stroke.

Water forced from C B = $d^2 \times .7854$

And water forced into N A = $D^2 \times .7854 \cdot x$

But these quantities are obviously equal

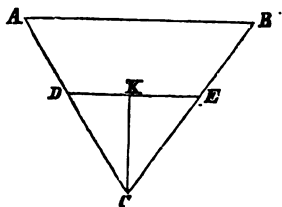
$$\therefore d^2 \times .7854 = D^2 \times .7854 \cdot x$$

or $x = \frac{d^2}{D^2}$ = space passed over by P' while P passes

over 1 or unity.

$$\begin{aligned} \text{But power gained} &= \frac{\text{space passed over by P}}{\text{space passed over by P'}} \\ &= 1 \div \frac{d^2}{D^2} = \frac{D^2}{d^2}, \text{ the same result as before.} \end{aligned}$$

2. " There is a barge whose section is an equilateral triangle, each side being a feet in length, and whose



length is b feet; how deep will it sink in the water, its weight and that of its lading being together w lbs?"

Let D be the water mark, and let $x = KC$

$$\therefore DE = 2 DK = 2 KC \times \tan. 30^\circ = 2x \tan. 30^\circ$$

$$\text{area } \triangle DCE = DE \times \frac{1}{2} KC = 2x \tan. 30^\circ \times$$

$$\frac{x}{2} = \tan. 30^\circ x^2.$$

$$\therefore \text{solidity of water displaced} = \tan. 30^\circ \cdot b x^2$$

But the weight of water displaced = weight of barge and lading; and a solid foot of water = 1000 oz.

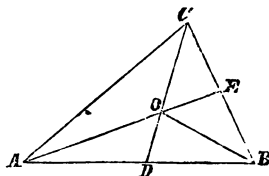
$$\therefore 1000 \tan. 30^\circ b x^2 = 16 W$$

$$\therefore x = \frac{2}{5} \sqrt{\frac{W}{10 \tan. 30^\circ b}}$$

3. "Define the centre of pressure of a fluid, and show that the centre of pressure of a rectangular flood-gate is situated at two-thirds its depth."

Suppose a rectangular vessel filled with water; then the horizontal pressure upon any point of its side will be equal to the perpendicular pressure at that point. Suppose this point to move with equal additions from the surface of the vessel to its base; then the pressures on the side will increase by equal differences from nothing to a pressure equal to the depth of the vessel. Therefore the sum of the forces acting on the side will be correctly represented by an isosceles right-angled triangle. There is obviously some point in the side of the vessel upon which the opposing forces would balance themselves; and if a pressure equal to that of the whole fluid on the side were applied to this point, the place would remain at rest. The point so determined is called the *centre of pressure*. This point is evidently coincident with the centre of gravity; since they are both determined by the same circumstance, viz. equilibrium of pressure.

To find the centre of gravity of a triangle, A, B, C. Bisect the sides A B and B C in the points D and E, and join the points of bisection with their opposite



angles. Then the centre of gravity will be in the line C D, because all lines drawn parallel to A B, and intercepted by the other sides of the triangle will be bisected by C D. For the same reason it is in A E; and since the centre of gravity is in each of these lines, it must be in O, their point of intersection.

Join the points O and B.

Since the side B C is bisected in E, we have

$$\triangle C A E = \triangle B A E$$

$$\text{And } \triangle C O E = \triangle B O E$$

Taking equals from equals we have equal differences

$$\therefore \triangle C A O = \triangle B A O$$

$$\text{Similarly the } \triangle C A O = \triangle C B O$$

$$\text{And } \therefore \triangle C A O = \triangle B A O = \triangle C B O \\ = \frac{1}{3} \triangle A B C.$$

Hence, any side of A B C being assumed as a common base, the height of the \triangle , whose vertex is O, will be one-third of the height of A B C, for it is on the same base and of one-third the area of the largest \triangle . Therefore the position of the centre of gravity will be one-third of the height of the triangle from the base, or two-thirds from the vertex.

SECTION III.

1. "How does the intensity of the light of a candle vary with the distance of the illuminated surface from the flame? Illustrate your meaning by a numerical comparison in some supposed instance."

The light received at different distances from any luminary is in the inverse proportion of the square of the distances. Thus, of three objects placed at 1, 2, 3 feet respectively, from a candle, the light of the first being the standard of comparison, that of the second would be inversely as 1 is to 2^2 or 4; that of the third inversely as 1 is to 3^2 or 9, in respect to the first, and inversely as 4 is to 9 in respect to the second.

2. "If a ray of light pass from air into water, what change takes place in its direction, and according to what law? Under what circumstance is it possible for a ray to pass out of water into air?"

A ray of light passing in an oblique direction from air into water, suffers a change in its previous direction. Instead of pursuing a straight line from the object which emits it to the point of contact with the water, and thence through the water, it is *refracted* or *broken back* at the point where it enters the water, and in a direction towards a perpendicular from the same point. The amount of this refraction varies with the media through which the ray passes; glass has a very considerable refracting power, oil less, alcohol less than glass, and water less than alcohol.

The angle between the *incident* or striking ray and a perpendicular from the point where the ray enters the water is called the *angle of incidence*, the angle between the same perpendicular continued downwards, and the refracted ray, is called the *angle of refraction*. When light passes out of a rare medium, as air, into a dense medium, as water, the angle of incidence is greater than

the angle of refraction. The sine of the angle of incidence is to the sine of the angle of refraction as 1.336 is to 1. For other bodies we should obtain different degrees of refraction; and the number, which in each case is the antecedent of 1 in the above ratio is called the index of refraction, or the refractive power of the medium in question. Thus, 1.336 is the index of refraction of water, and the ratio of that index to 1 is the *constant ratio of the sines*, a technical phrase in optics.

When light emerges from water it is deflected from its previous course towards the surface of the water, and the amount of this deflection is always the same. Hence, if the ray from beneath the water strike the surface at an angle equal to the amount of deflection, the ray will not pass out of the water; if it strike at any greater angle it will emerge.

3. "Explain the decomposition of light by means of a prism."

To decompose light by means of a prism, attach a prism to a small aperture in the shutter of a darkened apartment, so that it may intercept the ray or pencil of rays of the sun's light that would otherwise pass downwards to the floor or other object, and appear as a spot of white light. Place a white screen in such a position as to intercept the ray after it has passed through the prism and been refracted. The white spot of light that was received by the interposed prism will diverge and form on the screen an oblong image of the sun, containing seven colours, viz.: red, orange, yellow, green, blue, indigo, and violet. This elongated image is termed the *prismatic spectrum*, or, *solar spectrum*. By other experiments the seven coloured rays may be again conjoined or *recomposed*, when they are found to form a single beam of white light.

See Brewster's Optics.

4. "Show distinctly, how it is that a lens may be used, first as a burning-glass, and secondly, to correct defective sight."

A convex lens, such as is used in spectacles, converges all the rays of the sun that may be collected on it, into one intense ray, whose heat is sufficient to set fire to inflammable objects. Some large lenses of this kind concentrate a sufficiently intense pencil of the sun's rays to fuse metals.

The same description of lens, but of smaller size, is used to correct some forms of defective sight. At times changes occur in the crystalline lens of the eye, affecting its density, form, and refracting power. The consequence is an inability to see small objects, as the eye cannot converge the rays of light proceeding from them when they are sufficiently near to be seen in the ordinary state of vision. But this defect is remedied by the aid of a convex lens, which converges light from small distances to distinct foci on the retina, thus compensating the flatness of the crystalline.

SECTION IV.

1. "What* solid substances, and what gases, form the organic part of all vegetable and animal substances?"

The solid constituents of the organic parts of vegetable and animal substances are, 1, *protein* and its numerous compounds, as *albumen*, *fibrin*, *casein*; 2, *cellulose*, with which are associated starch, gums, and sugar; 3, wax, and the fats known as *stearin*, *margarin*, and *olein*; 4, *chlorophyle*, or the green colouring mat-

* The original form of the above question is, "What solid substance, and what three gases, form the organic parts of all vegetable and animal substances?" Ans. Carbon, Oxygen, Hydrogen, and Nitrogen.

ter of plants; 5, *gelatine*. The compounds formed from the above are very numerous, and chemists are continually adding to the list. The gases found in combination with the preceding solids are oxygen, hydrogen, and nitrogen.

2. "Describe the function of the leaf in plants by night and by day."

At night the leaves of plants emit carbonic acid gas and absorb oxygen from the surrounding atmosphere, thus vitiating the air by a double process. By day, and chiefly in sunshine, they, on the contrary, imbibe carbonic acid gas from the air and evolve oxygen, which is supposed to be derived from the carbonic acid which they absorb, the solid carbon being appropriated to the nutrition of the plant.

3. "From considerations founded on a knowledge of the inorganic constituents of plants, account for the fact that one crop will grow where another fails; that mixed crops grow well together; that a rotation of crops is necessary."

Some plants require more than others of particular inorganic substances, and, in the absence of such substances from a soil, would not flourish so well as other plants which abstract a less proportion of the same aliments. Thus, land which contains a very little lime might be suitable for the growth of rye-grass, but would afford a poor crop of clover or lucerne, as the latter plants require much lime. Similarly, some mixed crops grow well together, because each of the mixed plants abstract more of some and less of other inorganic constituents than is required by the other. The impolicy of continuing the same kind of cropping on the same land, arises from the fact that the land will soon be impoverished from the continued abstraction of those substances which the crop particularly

needs. Thus, grain crops require much magnesia and phosphoric acid, and only flourish when these ingredients exist in a fair proportion in a soil. Hence, if a field had been sown with wheat many successive years, the soil would become exhausted of these constituents, which must be restored by the application of such manures as contain them, or a change of crop must be resorted to.

4. "What are the chemical constituents of lactic acid? What relation does it bear to milk of sugar? In what way does the formation of lactic acid determine the separation of curds in milk? How may these be made to disappear, and in what way does the rennet act in cheesemaking?"

Lactic acid is composed of 6 equivalents of carbon, 4 of hydrogen, and 4 of water; or, according to Johnston (*Agric. Ch.* p. 943), of 6 of each of those elements. It is produced from the milk of sugar through the influence of the cassein or cheesy matter of the milk. Under the influence of the cassein the elements of a portion of the milk of sugar are made to assume a new arrangement, and lactic acid is the result. The simple contact of the cassein causes the elements of the milk of sugar to break up their old connection and to arrange themselves anew in another prescribed order. In milk the sugar and curd are naturally intermixed; but the cheesy matter, acting slowly on the sugar, induces a transformation in the arrangement of the elements of the sugar which is entirely displaced by the new compound from its own constituents, viz. lactic acid. But this lactic acid will not, like milk of sugar, remain intermixed with the curd, which, therefore, appears in a separate form. The acid, in fact, enters into composition with the soda of the cassein, or cheesy matter, forms lactate of soda, and leaves, in the form of curd,

that part of the cassein which is insoluble in water. The curds may be made to disappear by putting some soda into the curd and whey, to make up for that which has been abstracted from the cassein to form the lactate of soda.

Rennet curdles milk by acting on the milk of sugar and changing it into the new form lactic acid, which abstracts the soda of the cheesy matter as previously mentioned, and leaves apparent the insoluble curd. Most acids, and other animal membranes, besides rennet, act in the same way.

See Johnston's Lectures on Agricultural Chemistry.

POPULAR ASTRONOMY.

SECTION I.

Give one reason, and that the simplest, for believing—

1. That the earth is isolated in space.
2. That the form of the earth is nearly that of a sphere.
3. That the dimensions of the earth are those assigned to it in books on astronomy.

SECTION II.

1. Explain the phases of the moon, and illustrate your explanation by a diagram.
2. Under what circumstances is an eclipse of the sun total, or partial, or annular?
3. How often would similar eclipses return if there were no regression of the moon's nodes?

SECTION III.

1. Describe the apparent path of the sun in a summer's day in the arctic circle.
2. Show that more of the sun's rays fall on a given portion of the earth's surface when they are incident vertically, than when obliquely.
3. The extreme summer heat of Moscow is equal to that of Nantes, that of Tobolsk to that of Cherbourg, and that of Astrachan to that of Bordeaux. Account for these and similar facts.

SECTION IV.

1. Account for the apparently retrograde motions of the planets.
 2. On what causes do the variations of brightness in the planet Venus depend?
 3. What is meant by parallax? To what uses is the consideration of parallax applied, and what conclusions have been drawn from it?
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SECTION I.

“Give one reason, and that the simplest, for believing—

1. “That the earth is isolated in space.
2. “That the form of the earth is nearly that of a sphere.
3. “That the dimensions of the earth are those assigned to it in books on astronomy.”

1. Whatever part of the world we make the scene of our observations, similar appearances in the relative positions of the heavenly bodies, at different hours of the day, present themselves. The sun, moon, and stars, rise in one direction, and set in the opposite; and no part of the world affords an example of the absence of these phenomena. Now if these risings and settings are to be seen in all points of the horizon, and from every place, no other conclusion is admissible than that the earth is isolated in space.

2. At any point above the earth's surface—and especially above that of the sea—our extent of vision is bounded, except in cases of mists or other intervening

obstacles, by a clear, well-defined line, extending all round us. That this line is a circle we conclude from the similarity of all its parts, and from its apparent distance from us, being the same in whatever direction we observe it. Now every part of the earth affords the same appearances, and no other figure than that of a sphere will do so: hence the shape of the earth is globular, or spherical.

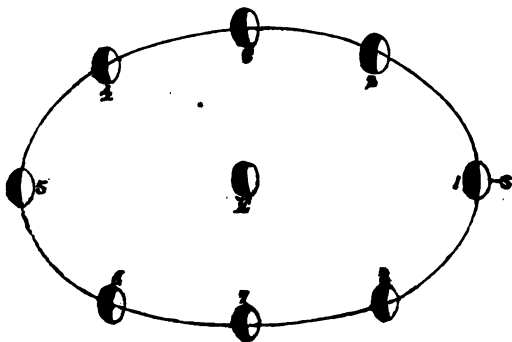
3. Our confidence in the modes of admeasurement that have been adopted, and in the persons by whom the admeasurements have been made, are corroborated by the rough teachings of our individual experience in changing our latitude. We know, practically, that in removing due north or south from any given latitude to any other latitude, the distance, in miles, between our two localities is just what is due to their stated difference of latitude. Thus, if a person go from the town of Buckingham, due south, through Reading, to Petersfield, he will have passed from lat. 52° to lat. 51° ; and the direct distance between the two places, about 70 English miles, is just the same part of the circumference of the earth, as given in works on astronomy, that 1° is of 360° , the whole circumference.

SECTION II.

1. "Explain the phases of the moon, and illustrate your explanation by a diagram."

In the following diagram, E is the earth—1, 2, 3, 4, 5, 6, 7, 8, different positions of the moon in its orbit; and S the direction of the sun. The enlightened halves are those towards the sun; the dark parts from the sun. Its position 1, the illuminated hemisphere of the moon is directed wholly from, and its dark half towards, the earth: this is *new moon*. In positions 3 and 7 half the light and half the dark sides of the moon are towards

the earth : these are the first and third quarters of the moon. At 5 the whole bright surface of the moon is towards the earth ; and, accordingly, it is *full moon*.



In the intermediate positions, 2, 4, 6, 8, the earth has *less, more, more, less* than half the bright side of the moon towards it. These different aspects of the moon, viewed from the earth, are termed the phases of the moon.

2. "Under what circumstances is an eclipse of the sun total, partial, or annular?"

Solar eclipses occur at the time of new moon, i.e., when the sun and moon are in conjunction ; or, when the sun, moon, and earth are in one line, and the moon between the sun and the earth. If the orbit of the moon coincided with that of the earth an eclipse of the sun would take place at each new moon. But the lunar orbit is inclined $5^{\circ} 8' 48''$ to the ecliptic, so that the conjunction may happen when the moon is in that part of her orbit too far removed from the ecliptic to allow the disc of the moon to overlap that of the sun, as seen from the earth. When the disc of the moon completely

overlaps that of the sun a total eclipse ensues. When the body of the moon hides a portion of the sun's disc a partial eclipse takes place. When the moon is in the most remote part of the orbit her disc is diminished, as viewed from the earth; and if an eclipse of the sun occur under such circumstances, and the moon's centre coincide with the sun's, the disc of the moon is not large enough to cover that of the sun, so that a ring of the sun is seen, while the other part of it is obscured, or occulted. This phenomena is the annular eclipse (*annulus*, a ring), and is of rare occurrence.

3. "How often would similar eclipses return, if there were no regression of the moon's nodes?"

In the absence of regression of the moon's nodes similar eclipses of the sun would occur on each completion of the moon's synodic revolution, or at the interval between the moon's leaving the sun and returning to her again, as viewed from the earth. In this period, 29 days 12 hours 44 minutes, the moon passes through all her phases, or completes a lunation. The eclipses of the moon would occur as frequently as those of the sun, but in the middle of the synodic revolution of the moon, the solar eclipses being due to conjunction, and the lunar eclipses to opposition of the moon: but this is only correct on the hypothesis that the moon's nodes are in conjunction, or opposition, for one eclipse, after which regression of the nodes is assumed not to occur; for if the moon's nodes were not in conjunction, or opposition, at the time of the cessation of their backward movement an eclipse could never occur.

SECTION III.

1. "Describe the apparent path of the sun on a summer's day in the arctic circle."

Within the frigid zone the apparent path of the sun, on a summer's day, would be a circle. When the sun attained the most elevated point of this circle it would be noon; when he reached the lowest point, it would be midnight; and *sunrise* would occur at the same instant with *sunset*, if we may so term the least visible elevation of the sun. At noon he would be seen in the south, and the place having noon would be directly intermediate between the pole and the sun. But twelve hours afterwards the place which was between the pole and the sun would have the pole between itself and the sun, which, consequently, would be seen in the north at midnight.

2. "Show that more of the sun's rays fall in a given portion of the earth's surface when they are incident vertically, than when obliquely."

If a circular piece of board be lodged on the upper surface of a globe having the same diameter with the board, and a light be placed immediately over the centre of the board, it is evident that the board will interrupt every ray of light and heat that would have fallen upon the globe in the absence of the board. But the shaded surface of the globe is greater than any section of the globe, such as the board. Hence, the rays of heat and light that would be received on the circular board, have, on its removal, to spread over a larger surface, and their intensity is proportionably diminished. And this diminution is in proportion to the distance of the globular surface from the centre of our supposed obstacle; for if we suppose the board to be very small in comparison with its distance from the luminary whose heat it interrupts, then equal portions of the board receive equal quantities of heat. But these equal portions of the board do not shade equal surfaces; and if we suppose it to be cut into concentric rings, with a circle in the centre,

each ring and the central portion being of equal area, the central portion would shade the least, the ring adjoining it more, and the outside ring the greatest portion of globular surface. More of the heat and light, therefore, would face on that part of the globe which was shaded by the central section of our supposed obstacle than on an equal portion of the surface shaded by the outer ring. In the first case the rays would be vertical; in the latter, slanting, or oblique; and the sun being substituted for our imaginary light, and the earth for the globe, the illustration required by the question is afforded.

3. "The extreme summer heat of Moscow is equal to that of Nantes, that of Tobolsk to that of Cherbourg, and that of Astrachan to that of Bordeaux. Account for these and similar facts."

From the reply to the preceding question it will appear that, as a general rule, the temperature of any place on the earth's surface is in proportion to its distance from that part of the earth which receives the direct rays of the sun—i.e., from the equator. But this rule is subject to important modifications, owing to the local circumstances of some situations. The greater or less column of the atmosphere, over any place, is a datum of only inferior importance to that of the variation in the obliquity of the sun's rays; for the denser the air, the greater its capacity for heat. Now the column of air is greater at the sea-level; and the greater the elevation of the land the less is the weight of the superincumbent atmosphere. Hence, we should expect for the same latitude a higher temperature in countries near the sea than in others situated inland, and having a greater elevation above the sea-level. And for the average annual temperature this is the case; but many causes operate in producing excep-

tions. Nantes, Cherbourg, and Bordeaux, on account of their proximity to the sea, and free exposure to the moist westerly winds from the Atlantic, have a lower summer temperature than is due to their latitude. On the other hand, Moscow, Tobolsk, Astrachan, have a higher summer temperature than their latitude would lead us to expect, and for the following reasons:—They are surrounded by vast tracts of land, which, in the long days, and under the powerful sun of summer, acquire a much higher temperature than similar tracts of water would accumulate. The accumulated heat of the land is transferred to the atmosphere, which is further raised in temperature by the influx of vast volumes of heated air supplied by the easterly winds from the great deserts of central Asia. The soil of these places, too, is itself sandy, and therefore more capable of absorbing and retaining the solar heat than the more compact soils of the localities with which they are contrasted in our question.

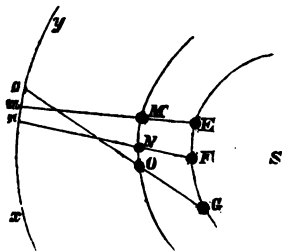
The mild and genial climates of southern Europe, as compared with the same latitudes in America, afford a striking contrast between the effect of proximity in the first case to the great arid deserts of Africa; and in the second, to the ice-bound ocean to the north of the American continent.

The free egress afforded to the ice of the Antarctic ocean, by the absence of a belt of land, such as to a great extent confines that of the Arctic, causes a considerable diminution of the temperature of some southern latitudes, as contrasted with those equally far north of the equator. The greater preponderance of land in the northern hemisphere affords another reason for the higher temperature that prevails in it than in the southern; for the land reflects better than water the solar heat which it receives to the air above it.

SECTION IV.

1. "Account for the apparently retrograde motions of the planets."

From our station, the earth, we observe a *section* of the movements of the planets, in contradistinction to what may be termed a *plan* of the same movements.



Sometimes they seem to advance—then to relax their rate of progress—then to cease moving entirely—then to reverse their motion; but, with all their irregularities, to have a greater amount of direct than of retrograde motion. These anomalies will be in some measure accounted for by reference to the above diagram. To explain all the peculiarities of apparent planetary motions would require many complicated diagrams, for which the reader is referred to the works of Herschell, Dick, &c.

In the above figure S is the sun; E F G, three positions of the earth in its orbit; M N O, three positions of a planet in its orbit. From the earth the position M of the planet would be referred to *m* in *x y*, the concave of the heavens. When the earth advanced to F and the planet to N, the latter would be referred to the position *n* in the heavens, and would consequently have appeared to have advanced from *m* to *n*. When

the earth reached G and the planet O, the latter would be seen among the fixed stars at *o*, and would, consequently, have appeared to have performed a backward, or retrograde motion. At an intermediate point between the real advance and the apparent retrogression, the appearance of a short cessation of motion would be presented. The view that would be afforded of a race-course from a station considerably remote presents a familiar illustration of the apparent motions of the planets whose orbits are without ours.

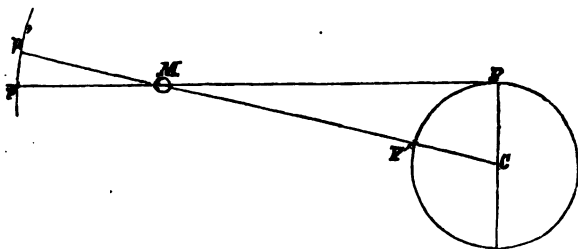
2. "On what causes do the variation of brightness in the planet Venus depend?"

We see more or less of the illuminated disc of Venus according to the part of her orbit in which she is advancing. When she is in her greatest elongation she appears like a half moon; in her progress thence to her inferior conjunction (i.e., intermediate position between the sun and earth) she becomes a crescent; but, within certain limits, affords greater light than at her elongation, from the fact of being much nearer the earth, and giving light from a portion of an illuminated disc of greater apparent diameter.

3. "What is meant by parallax? To what uses is the consideration of parallax applied, and what conclusions have been drawn from it?"

Parallax is the apparent angular change in the position of a heavenly body as viewed from different points of observation. In journeying along a railway we observe the bearing of distant objects to vary with our change of place. At one time, for instance, we see a church due east from us; and after going some miles to the north the same church would be seen in a southeasterly direction. The angle between two points in which the church appears in the horizon is the parallax of the church as seen from the two supposed stations.

The more remote the object the less the parallactic displacement due to a given distance between the places from which parallax is observed. Astronomically speaking, parallax is limited to the different apparent positions of the heavenly bodies when viewed from the surface of the earth, and as they would appear from its centre. Now it can be determined in what part of the heavens any heavenly body, as the moon, would appear if viewed from the earth's centre; and actual measurement informs us of the position in which



the same body appears from the earth's surface. For instance, in the above figure, suppose the moon M to be viewed from P on the earth's surface, and also from P' , the point through which a line from C , the earth's centre, would pass to the moon; and let it be supposed that the moon is in the horizon of P at the time of observation. From P the moon would appear among the stars at p , and from P' at p' . Under the circumstances assumed, the angle $p'Mp$, which is the angle of parallax, and equal to angle PMC , would be found to be $57' 5''$. But the angle MPC is a right angle, as we have supposed the moon to be in the sensible horizon of P . Hence, the three angles of the triangle MPC are known; for $\angle PCM = 90^\circ - 57' 5'' =$

$89^{\circ} 2' 55''$; and $P C$ = radius of the earth = 3965 miles. From these data, $M C$, the distance of the moon from the centre of the earth may be found; for if $M C$ be radius, $P C$ is the sine of angle $P M C = .016605$ to unity as radius. And $M C$ exceeds unity as many times as 3965 exceeds sine of angle $P M C$ to unity as radius; that is, radius $M C = 3965 \div .016605 = 238,800$, nearly. In round numbers we usually say the moon is 240,000 miles from the earth, and, in reality, she is sometimes more than, and sometimes less than the result of our calculation, as her orbit is elliptical. Similarly, the parallax of other heavenly bodies has been the means by which astronomers have determined their distances from the earth. The *fixed stars* obtain their appellation from the circumstance that they never change their relative positions *inter se*; and the nicest observations, with our most perfect instruments, and made at all parts of our orbit, fail to indicate any increase or diminution in the angle which one of the fixed stars makes with another. As the result of some astronomical observations, it may be remarked, that the nearest of the fixed stars *cannot be so near* the earth as 100,000 times the earth's diameter. This is a deduction from the fact that none of the stars have any parallax from the earth's diameter as the basis of observation.

VOCAL MUSIC.

SECTION I.

1. Give the *names* of the notes, as commonly employed in instrumental and vocal music respectively.
2. Write down the *shapes* of the notes, and explain their relative value.
3. Explain the Diatonic scale, and show what are the intervals between each successive note, in the major mode.

SECTION II.

1. Write down the different *rests*, and show their respective value.
2. Write down the treble, tenor, and bass clefs, and explain their meaning.
3. Explain what is meant by a unison, an interval, a sharp, a flat, a dotted note, and a bar.

SECTION III.

1. What is meant by *time*, and what is the distinction between common and triple time? Explain the meaning of compound time?
2. What is meant by *accent*, and what does it differ from time?

SECTION IV.

1. What is tranposition?

2. How is the use of sharps and flats rendered necessary by it?
3. Explain the *order* in which the scales follow each other, and how they give rise to the use of the different semitones on the chromatic scale.

¶ Write short passages of music in the time indicated respectively by C, $\frac{3}{2}$, $\frac{3}{4}$, each in a different key.

SECTION I.

1. "Give the names of the notes as commonly employed in instrumental and vocal music respectively.

The shape-names of notes employed in both instrumental and vocal music are, Breve, Semibreve, Minim, Crotchet, Quaver, Semiquaver, Demisemiquaver, and Hemidemisemiquaver: the last two, however, are confined to instrumental music. The sound-names are of two kinds, the one now beginning to be generally applied to vocal, and the other, the old terms, mostly retained in instrumental music. They are as follows:

Vocal,	Do, Re, Mi, Fa, Sol, La, Si.
Instrumental,	C, D, E, F, G, A, B.

The eighth sound from any particular note is termed its *octave*, and receives the same name as that note. The former of these designations for the sounds of a musical scale have, in England even, long been familiar to musicians, especially those who have completed their course of study on the Continent; but the unparalleled success of Wilhem's system, under the direction of Mr. Hullah, and the scarcely less indefatigable exertions of Mr. Mainzer, have given such an impetus to

the spread of those syllables that the old alphabetical names are almost wholly superseded. It matters little in *speaking* of a sound what name is used so that the sound is known; but in singing, the letters are decidedly inferior to the syllables.

2. "Write down the shapes of the notes and explain their relative value."

The notes,



placed upon the staff in the accompanying figure, are shown in the order of their relative value, and according to the order of the shape-names referred to in the answer to the preceding question. The shape of the note determines the length of time its sound, when produced, is to continue; as the notes are written above, the shape of each succeeding one indicates one half the length in time of that which precedes it, whatever the time of the first may happen to be: for the absolute time of notes differs, but the relative time is constant.

3. "Explain the Diatonic scale, and show what are the intervals between each successive note in the major mode."

A scale in music is a succession of sounds, not less than eight in number; which succession terminates upon the octave of the particular sound upon which it commenced. The Diatonic scale is one in which the number of sounds, when considering the scale only, is limited to eight; and those sounds following each other at defined intervals, according to the *mode*. In the major mode of the Diatonic scale, the intervals, tone

and semitone, succeed each other in the following order ascending; two tones, a semitone, three tones and a semitone, and *vice versa* in descending.



SECTION II.

1. "Write down the different rests, and show their respective values."

The following are the *rests* corresponding in time with the notes whose names they bear. Rests are often used in music in the place of notes to indicate that the performer is to make a temporary cessation; the length of time being denoted by the shape of the rest employed.

1.  The Breve Rest
2.  The Semibreve Rest
3.  The Minim Rest
4.  The Crotchet Rest
5.  The Quaver Rest
6.  The Semiquaver Rest
7.  The Demisemiquaver Rest
8.  The Hemidemisemiquaver Rest.

2. "Write down the Treble, Tenor, and Bass Clefs, and explain their meaning."



1.  The Treble, Sol, or G Clef
2.  The Tenor, Do, or C Clef

3. : The Bass, Fa, or F Clef

Clefs are placed at the commencement of music to indicate by what class of voice the piece is to be executed. All the vocal sounds cannot be produced by a single voice; but all which the range of that voice will in general include, can be placed upon a stave of five lines, while the sounds which the different classes of voices can together produce, range over a stave of eleven lines. Now, when the first or upper five of those lines are used, the Sol clef is employed to show the same; when the middle (or about the middle) five, the Do clef is used; and when the lower five, the Fa clef. See Hullah's Manual.

3. "Explain what is meant by unison, interval, a sharp, a flat, a dotted note, and a bar."

A *unison* is produced by the successive recurrence of any particular sound; and is in contrast with an *interval*, which is the distance between any two such sounds.

A sharp () is a character used to show that a note which follows it upon the stave, is raised a semitone above its usual pitch; a flat () denotes a depression to the same extent. To protract the sound of any note to one half more than its usual length, a *dot* is placed after it, when it is termed a *dotted note*. A *bar* was originally the short line employed to divide the music into portions in reference to time; and is now used to designate one of those portions itself.

SECTION III.

1. "What is meant by time, and what is the distinction between common and triple time?" Explain the meaning of compound time."

The time of a piece of music is decided by the length

and accent of its bar, and not wholly by the duration of the execution of the bar; a piece of music with three beats in the bar may take as long to execute as a piece of an equal number of bars with four beats in each; but the former would be in triple time, and the latter in common. A bar of common time may be represented by a square; whatever the common note placed at each corner, if the four or their equivalents were transferred to a bar, it would be one of common time. In the same manner, a triangle will represent a bar of triple time. The signs of common time are C,

C and $\frac{2}{4}$; the two former, were the fractional signs used as in all other cases, would be represented by $\frac{4}{4}$ and $\frac{2}{2}$. The compound time is also common and triple. Compound common time is a combination of triple with common, and may be represented by the square with three notes at each corner; thus, when made compound, C would become $\frac{12}{8}$ and $\frac{2}{4}$, and $\frac{6}{8}$. Compound triple is a doubly triple time, and may be represented by a triangle with three notes at each corner; thus $\frac{3}{4}$ and $\frac{3}{8}$ would respectively become $\frac{9}{8}$ and $\frac{9}{16}$.

2. "What is meant by accent, and in what does it differ from time?"

Accent is a stress laid upon particular notes in a bar defined by the movements of the passage. Time is dependent upon accent; but not identical with it, because accent is not at all influenced by the length of time in which a bar of music is performed. In common time the accent is on the first and third beat in the bar; in triple, on the first only.

SECTION IV.

1. "What is transposition?"

Transposition is changing the tonic of a piece of music, so that the whole piece may be performed at a higher or lower pitch with exactly the same intervals as previously. (See Hullah's Manual).

2. "How is the use of sharps and flats rendered necessary by it?" (i.e. transposition).

A musical passage in the natural, or Do scale, has, upon every recurrence of the interval between the third and fourth, and seventh and eighth, a semitone in those positions; as well as in certain others, major or minor thirds, perfect fourths, or tritones, and so on, through the whole class of intervals. Now, if it be thought necessary to change the tonic of a passage to a higher pitch, or key, say Re, it is evident that we shall come to the minor second, &c. in ascending the scale, an interval earlier than before; inasmuch, as we shall have the tone between the second and third steps change place with the semitone of the third and fourth steps. We must therefore fall upon some method of rectifying the discrepancy. It is obvious that both intervals will accord with those of the previous scale, if we can raise the third sound of the new scale a semitone. Now the province of the sharp is to do so. For the same reason a sharp must be placed before the seventh sound of the scale. Thus we see the scale of *re* requires two sharps. In a similar manner we may show the necessity of employing flats. Suppose we wished to make *fa* the tonic; then, in order to have a semitone between the third and fourth of the scale, and a tone between the fourth and fifth, *si* must be flattened.

3. "Explain the order in which the scales follow each other, and how they give rise to the use of the different semitones on the chromatic scale."

By fully following out the method touched upon in the preceding answer, it would be discovered that the scale of Sol has one sharp; Re, two; La, three; Mi, four; Si, five; &c. Again, with flats, that Fa has one; Si flat, two; Mi flat, three; La flat, four; Re flat, five, &c. From this succession of scales, and their requisite sharps and flats, we find that the scale whose tonic is a major fifth above Do, must have one sharp; the one a fifth above that must have two, and so on; the same order obtain with the flats, except that instead of taking the fifth *above*, it is taken *below*.

It seldom happens that even the simplest piece of music, if of any length, does not modulate, or change from its original scale to some other, generally the one a fifth *above* or *below*. In thus modulating, a sharp or a flat must be used; and if that sharp or flat is used to raise or depress a note of the same name as the preceding one, then a chromatic semitone is produced; as is the case in Wilhem's "Leaving Port" (Hullah's Course). There the original scale is Do; it modulates into Sol; to do which, the *fa*, in the third part, is sharpened to form the leading note to the latter scale.

¶ "Write short passages of music in the time indicated respectively by C, $\frac{3}{2}$, $\frac{3}{4}$, each in a different key."

In preference to subjoining passages, we refer to the following tunes, copies of which are probably in the possession of every teacher, and will answer the latter two requisites, "The Old Hundredth," "Hanover," and the "National Anthem." The first is usually written in the scale or key of La, or A; the second, in Si flat or B flat; and the last in Sol or G.

G E O G R A P H Y.

SECTION I.

1. Name the principal ports in the Mediterranean Sea.
2. Name the principal divisions of the British possessions in North America. Point out the parts chiefly inhabited by a population speaking the French language, and account for its being found there.
3. Draw a map of England, marking thereon the principal rivers ; also the Manufacturing Districts, thus—O ; Dock Yards, thus—D ; Cathedral Cities, thus—X ; Mining Districts, thus—M.

SECTION II.

1. What might we expect to be the cargoes of vessels coming into an English port from the Baltic and from the Levant ?
2. Name the principal mineral productions of Europe, and the countries from which they are derived.
3. Mention the articles of manufacture for which each country on the Continent of Europe is most distinguished, and the principal seats of each.

SECTION III.

1. Give some account of the climate of Hindostan, and of the periodical rains ; name the presidencies

into which the British dominions in India are divided, and what religions prevail in those countries.

2. Describe and account for the Monsoons, the Trade Winds, and the Gulf Stream.

SECTION IV.

1. Mention the principal mountain ranges of the world, with the elevations of their highest summits.
 2. What animals are most widely distributed over the earth? Describe any changes which they undergo in different climates.
 3. Name the chief races of men, the parts of the globe which they severally occupy, and their principal characteristics.
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SECTION I.

1. "Name the principal ports in the Mediterranean Sea."

In Spain—Gibraltar, Malaga, Carthagena, Valencia, Tarragona, Barcelona. In France—Marseilles, Toulon, Frejus. In Sardinia—Genoa. In Italy—Leghorn, Civitá Vecchia, Naples, Reggio, Taranto, Otronto, Venice. In Austria—Trieste. In Sicily—Messina and Palermo. In Greece—Napoli and Navarino. In Turkey, in Asia—Smyrna and St. Jean d'Acre. In Malta—Valétta. In Minorca—Port Mahon. On the coast of Africa—Algiers, Tunis, Bona, Ceuta, and Tangier, the last on the Straits of Gibraltar.

2. "Name the principal divisions of the British dominions in North America. Point out the parts

chiefly inhabited by people speaking the French language, and account for its being found there."

*States.**Chief Towns.*

Lower Canada	Quebec, Montreal.
Upper Canada	Toronto, Kingston.
New Brunswick	Fredericton, St. John's.
Nova Scotia	Halifax, Picton.
Newfoundland	St. John's.
Cape Breton	Louisburg, Sidney.
Prince Edward's Island ..	Charlotte Town.
Labrador	Nain Fort.

Louisburg, Canada, and Cape Breton were French colonies, till the *seven years' war* (1756—63), during which they were taken by the English. Hence the French language is perpetuated in them in varying degrees, though English is learned by the middle and upper classes.

3. "Draw a map of England, mark thereon the principal rivers; also the Manufacturing Districts, thus—O; Dock Yards, thus—D; Cathedral Cities, thus—X; Mining Districts, thus—M."

This question requires a mode of reply which, if adopted here, could subserve no useful end, and would in some degree augment the price. Maps of England are accessible to all.

SECTION II.

1. "What might we expect to be the cargoes of vessels coming into an English port from the Baltic and from the Levant?"

From the Baltic—timber, hides, tallow, wheat, oats, flax, hemp, iron, bark, turpentine, resin, tar, pitch, wood-ashes, flax-seed, salt fish, and furs. From the

Levant—coffee, carpets, silks, fruits, drugs, and perfumes.

2. "Name the principal mineral productions of Europe, and countries from which they are derived."

Gold, in small quantities, from the sands of the Danube, the Tagus, the Rhine, and the Rhone. Also, in partial and insignificant quantities, in some streams of Ireland, Scotland, France, and other countries of Europe. The most profitable mines are those of the Oural.

Silver, at Schemnitz and Kremnitz, in Austria, at Kongsburg, in Norway, and in small quantities in most lead-producing districts.

Platina, usually found in connection with gold, abounds in the Ural mountains.

Iron is found in inexhaustible abundance in Great Britain, and is plentifully dispersed over France, Sweden, Norway, Russia, and most of the countries of Europe.

Copper abounds more in England than in any other part of the world of equal extent. It is also found in Sweden, Norway, Austria, and Russia.

Lead, in most countries of Europe; but chiefly in Spain, the British Islands, France, and Germany.

Zinc, in the same localities as lead.

Tin, chiefly in England, but to some extent in Saxony, Bohemia, and Gallicia.

Quicksilver, in Hungary, Spain, and Deuxponts, in Germany.

Coal, in England, Scotland, Belgium, Prussia, and France.

Sulphur, in Italy, Sicily, Iceland; and in compound forms in England and Spain.

Salt, in England, Poland, France, Hungary, Germany, and most other countries, to a greater or less extent.

Nitre, in Spain, Hungary, and Russia.

Ammonia, in connection with sulphur.

Soda, chiefly from countries on the Mediterranean.
In Spain its manufacture occupies many of the inhabitants of the maritime districts.

Amber, in Russia.

3. "Mention the articles of manufacture for which each country on the Continent of Europe is most distinguished, and the principal seats of each."

France is noted for silk goods, chiefly manufactured at Lyons ; for laces, of which Valenciennes is the chief seat ; for watches and jewellery, chiefly at Paris ; for gloves, chiefly at Lisle ; for wines, over most of the south and south-west, as Champagne and Burgundy ; for *brandy*, in the neighbourhood of Cognac.

Spain supplies wines from Heres, &c.

Italy affords wines throughout its whole extent, and straw-plait and similar products from Tuscany.

Germany manufactures linens at Elberfeld, and clocks in many towns.

Holland and Belgium manufacture linens, lace, and carpets ; gin ; and works in metal ; and in connection with these articles, as enumerated above, may be mentioned, Rotterdam, Brussels, Amsterdam, and Namur.

Prussia supplies carpets from Berlin, and sail-cloth and cordage from Dantzic.

The remaining countries have no characteristic manufacture.

SECTION III.

1. "Give some account of the climate of Hindostan, and of the periodical rains ; name the presidencies into which the British dominions in India are divided, and what religions prevail in those countries."

India, in common with all tropical countries, pre-

sents no resemblance, in respect to climate, to the spring, summer, autumn, and winter of temperate regions. Its only seasons are the rainy and the dry; the former lasting from the end of April till the end of October; and the latter occupying the remainder of the year without the intervention of a shower or a cloud. The forest and jungles only maintain their verdure against the prolonged drought of the dry season. The plains become parched and denuded of every trace of vegetation; but a few days of rain suffice to effect a magic transformation, to displace desolation and aridity by a luxuriant and enchanting verdure. The low-lands are soon inundated by the incessant torrents; and, for weeks together, not a gleam of sunshine can penetrate the frowning canopy of massive clouds that overhang the land. The preceding account applies to India generally; but the length of the rainy season is by no means uniform in all parts of that great country. In some parts the rains continue for eight months of the year—in others but two. In respect to temperature, too, great variety is observable—from almost insufferable heat, to intense cold; dazzling clearness, of atmosphere—dense and unwholesome fogs; intolerable sultry, and unremitting rains: such are the vicissitudes of the climate of Bengal. Within recent years our troops have had bitter experience of the severity of winter in the elevated regions of northern India.

British India is divided into three great governments, called presidencies; Bengal, under the direct rule of the governor-general of India; Madras, and Bombay. The majority of the Hindoos are Polytheists, their principal deities being Brahma, Vishun, and Siva—i.e., the creator, the preserver, and the destroyer. Their superstitions and idolatrous worship is generally called the Brahminical religion, as their priests are *Brahmins*.

The Mahommedans are numerous—especially in the northern provinces. *The Christians of St. Thomas*, inhabiting the southern part of the Malabar Coast, profess to have derived their creed and discipline from the missionary labours of the apostle whose name they bear. Ancient and independent traditions in the Christian church of the west, give countenance to this claim, which is further corroborated by the episcopal government and other institutions of these primitive confessors of the cross. Buchanan, in his “*Christian Researches*,” supplies most interesting details on this subject. The operations of our own missionaries are daily becoming more encouraging; but never had a new faith such difficulties to contend with as in the case of the deep-rooted professions of the Hindoos.

2. “Describe and account for the Monsoons, the Trade Winds, and the Gulf Stream.”

Since the Monsoon is a modification of the Trade Wind, it will be more convenient to describe the latter first.

The direct rays of the sun in the tropics produce a rarefaction and displacement of the air, varying in amount with the nearness to, or distance from, the centre of the heated belt lying under the vertical sun. The rarefied and buoyant air ascends, leaving a partial vacuum, towards which the denser atmosphere of colder latitudes continually flows. But the currents of cooler and heavier air have less westward motion than the lower latitudes of the rotating surface over which they pass; for the motion caused by the daily revolution of the earth on its axis, varies with the latitude, being about 1000 miles per hour at the equator, and nothing at the poles. Hence, these supplying currents lie on the moving surface of the earth; or, more precisely, only acquire its motion by such a gradual process as

to present a distinct tendency *towards the west*, the direction *from* which the earth turns. But the resultants of these two forces, the one acting towards the equator and the other from east to west, is a continuous *north-east* and *south-east wind*; and its uniformity, and great utility to seamen, have acquired for it the name of the Trade Wind. Its limits are from the equator to about 30° N. and S. This account applies in strictness to the wide expanse of the open ocean only. Local variations occur, sometimes of a perfectly inexplicable nature; but the common disturbing causes to the regular operation of the *Trades* are—the intervention of land, the greater or less capacity of that land for the reception and radiation of heat, changes in the direction of the aerial current by mountain ranges, &c.

The Monsoons are periodical winds that prevail in the Indian Ocean, their direction being from the N. E. for six months of the year, and from the S. W. the remaining six months. The north-east Monsoon is simply the Trade Wind, and the period of its continuance is from the autumnal to the vernal equinox. The south-west Monsoon lasts while the sun is to the north of the equator, and when, consequently, the land which bounds the Indian Ocean on the north is more heated than the neighbouring ocean. The cooler and denser air from the sea supplies the place of the rarefied air over the land, and carries with it, to its higher latitude, the greater velocity that pertains to it from its previous rate of rotatory motion with the earth from west to east. Hence, besides its motion to the northward, it has an increased tendency to the east, and forms the south-west Monsoon. Terrific thunders and lightnings, variable winds, storms, heavy squalls, accompany the changes of the Monsoons.

The Gulf Stream is a portion of the great equatorial current of the sea, produced by analogous causes to

those which give rise to the trade winds. The great heat of the tropics causes a rapid and extensive evaporation, to supply which, the water of higher latitudes flows towards the equator; but in doing so, it does not acquire the rate of motion belonging to the equatorial regions, and hence is *left behind*; or the earth has a greater velocity from west to east than the waters within certain limits of the equator, so that, in effect, the water flows to the west. The body of water which, in obedience to this law, flows from Africa towards America, on striking the shores of Brazil, becomes divided into two parts. One of these flows to the south-west into the Pacific; the other passes into the gulf of Mexico, sweeps round its shores, from Yucatan to Florida, and passes through the straits of Florida under the name of the Gulf Stream. The comparatively narrow gorge through which it flows, with its vast accession of waters from the rivers of North America, combine to increase its velocity at the point of its exit. This acquired velocity suffices to carry it along the shores of the United States, whence it strikes off in a north-easterly direction to the banks of Newfoundland, and thence in a south and east course to the Azores, to the shores of Europe and Africa, the starting point of its grand tour.

SECTION IV.

1. "Mention the principal mountain ranges of the world, with the elevation of their highest summits."

The most elevated mountain-chain in the world is the Himmalaya, between India and Tartary, and its highest point is Dharwaligeri, or Dharvalagiri. Various heights are given for this mountain, from 29,000 to 26,800 feet. The Andes rank next in height; and their most conspicuous peaks are Sorata, 25,400; Antisana, 19,136; Cotopaxi, 18,167; Chimborazo, 21,436. The great knot of mountains, called Hindoo

Coosh, have some elevations of more than 20,000 feet. Elburz in the Caucasus, reaches the height of 18,350 ; and Ararat, belonging to the same range, to 17,700. The Alps include Mount Blanc, 15,668 ; Rosa, 15,527 ; Jungfrau, or Virgin, 13,730 ; Schreckhorn, 13,310 ; Ortler Spitz, 13,065 ; Simplon, 11,730 ; and St. Gothard, 10,605. The Rocky Mountains in North America, with their ramifications under different names in Mexico and Russian America, have among their summits, Mount St. Elias, 17,836 ; Popocatepetal, 17,780 ; Mount Fair Weather, 14,736 ; and James' Peak, 11,500. In the mountain range of Sumatra, is Mount Ophir, 13,840. Some nameless peaks of the Abyssinian mountains attain a height of about 13,000 ; the same may be said of the Cameroons, in Africa. Mulhacen, 11,678, is the highest peak of the Sierra Nevada ; and Maladetta, 11,436, the highest of Pyrenees in Spain. The highest peak of Mount Lebanon, is 11,050. Some other noted elevations, not all being in mountain chains however, are Mount Sinai, 7,952 ; Blue Mountains in Jamaica, 7,278 ; Olympus, 6,600 ; Adam's Peak, in Ceylon, 6,650 ; Mount Washington, in the Apalachian, or Alleghany mountains, same as last ; Parnassus (Greece), 5,850 ; Mount Ida, 5,800 ; Etna, 10,870 ; Hecla, 5,010 ; Vesuvius, 3,978 ; Ben Nevis (Grampians), 4,370. Table Mountain (Cape of Good Hope), 3,582 ; Snowdon, 3,571 ; Helvellyn, 3,055 ; Skiddaw, 3,022 ; Peak of Teneriffe, 12,200, &c.

2 "What animals are most widely distributed over the earth ? Describe any changes which they undergo in different climates."

This, and the following question, are answered in the words of Professor Sullivan, whose books are so well known and appreciated among teachers.

"The most useful animals, like the most important

vegetables, are the most widely distributed. The ox, the horse, and the hog, are found from the equator to the polar circles; while the sheep, the goat, and the dog, extend over the whole habitable globe. Horses and oxen, indeed, degenerate and disappear as they approach the frigid zone, but their places are supplied by the existence of animals peculiarly adapted to those dreary regions. The uses of the *rein-deer* to the Laplanders are well known, and animals of the same species abound in the Arctic regions of Asia and America. The dog too, the affectionate and faithful follower of man, in every country and in every clime, becomes doubly serviceable to him in those desolate regions where the assistance of other animals is denied him. Where the horse and rein-deer disappear, a hardy and sagacious species of dog, peculiar to the Polar regions, supplies their place. It is on sledges, drawn by dogs, that the Esquimaux and Kamtschatdales travel over their snowy plains."

"The correspondence between the covering of animals and the climate which they inhabit, is strikingly exemplified in the dog species. In the polar regions (*a*) they are covered with thick shaggy hair, resembling wool; while in warm countries, as in Bombay, their skin is perfectly smooth and almost destitute of hair. In the same way, the thick warm wool which we see upon sheep here, changes into *hair* in the torrid zone. Even in the same country the covering of several animals changes with the changing seasons. As Dr. Paley has observed on this subject, 'every dealer in hare-skins and rabbit-skins knows how much the fur is thickened by the approach of winter.'"

(*a*) "The animals of the frigid zones, generally speaking, are covered with rich fur, which not only protects them from the extreme cold of those regions, but supplies man with articles of comfort and luxury."

3. "Name the chief races of men, the parts of the globe which they severally occupy, and their principal characteristics."

"The human family is usually divided into five great branches, or varieties, namely, the Caucasian or European, the Mongolian or Asiatic, the Ethiopian or African, the Malayan and the Indian, or native American. The colour of the skin is so different in each of these races, that a good *popular* division of them, and consequently of the whole human family, would be into white, yellow, black, brown, and red men. We shall add the chief characteristics of each race.

"The Caucasian race was so called on the supposition that they originally came from the valleys of Caucasus, between the Black and Caspian Seas—a region not far distant from the cradle of mankind. This supposition is countenanced, if not confirmed, by the fact that the distinguishing features of this race are found, even at the present day, in the greatest perfection, among the inhabitants of those primitive regions. The Georgians and Circassians, for instance, afford perfect specimens of it.

"The Caucasian race is distinguished from all the rest by a natural complexion of white, tinged with red; as in infants, and in persons not exposed to the influence of the sun and air. Generally speaking, the head is round, the forehead expanded, the face oval, the nose thin, straight, or slightly aquiline, the mouth small, and the chin full and rounded. The hair varies in colour from fair to black, and is generally soft, flowing, or slightly curled; and the eyes from blue to dark brown.

"The Caucasian race includes the whole European family (except the Laplanders and Finns) with their descendants in America, &c.; also the nations of Western Asia, as far as the river Oby, the Belur Tag,

and Himaleh mountains, and the Ganges, and the people of Northern Africa, Egypt, and Abyssinia.

"The Mongolian race comprises the natives of Asia beyond the Oby, the Belur Tag, and Himaleh mountains, and the Ganges (except the inhabitants of Malacca); as the Mongolians, the Chinese, the Japanese, the people of Thibet, Boutan, and Indo-China, the inhabitants of the Arctic regions; as the Samoieds, Kamtschatdales, Finns, Laplanders, and Esquimaux. The characteristics of this race are, the skin yellow, or olive, the head almost square, the forehead low and narrow, the face large and flat, the nose small and flat, the mouth wide, the lips thick, the chin pointed, and the cheek-bones prominent. The hair is coarse, lank, black; and thin; and their eyes small, black, and rising in an oblique line from the nose to the temples.

"The Ethiopic, or Negro race, comprises all the natives of Africa to the south of the Sahara and Abyssinia; also the natives of New Holland, Van Diemen's Land, Papua, or New Guinea, New Britain, Solomon Isles, New Georgia, the New Hebrides, New Caledonia, the Feejee Islands, and also various tribes in the Indian Archipelago. The chief characteristics of this race are, the skin black, the head narrow and compressed at the sides, the forehead low and retreating, the cheek-bones prominent, the nose large and flat, the lips thick—particularly the upper one—the jaws narrow and projecting, the chin small and retracted, the eyes black, and the hair black, coarse, frizzled, and woolly.

"The Malay race, includes the natives of Malaya, Ceylon, the Asiatic Islands, New Zealand, and Polynesia. In this race the skin is brown or tawny; the form of the head intermediate between that of the European and Ethiopic races, the forehead a little arched or rounded, the nose full and broad, and thick towards the point, or what is called a bottle nose, the

upper jaw somewhat less projecting, and the features generally more prominent than in the negro; the eyes black, and the hair black, coarse, curled, and abundant.

"The Indian, or American race, comprises all the native American tribes, except the Esquimaux. The colour of their skin is reddish, resembling that of copper or cinnamon; the forehead is short and depressed, the eyes sunk; the face broad, without being flat; the nose rather flat, but prominent; the nostrils very open, the cheek-bones high, the beard thin and scanty, and the hair black and lank.

"The Malay race approximates to the Ethiopic, and the Indian to the Mongolian.

"In every period of their history, and in every part of the world, the Caucasian, or European race, have proved themselves superior to all the others in enterprise, energy, and courage. The inhabitants of every country and climate have felt, and acknowledged, their superiority, and the whole world seems destined, at no distant day, to come under their dominion. A great portion of the Old World is already subject to their sway, and the whole of the New Continent may be said to belong to them and their descendants. In the remote and multitudinous islands of the Pacific Ocean, the voices of their missionaries are heard; and their colonists are pushing their settlements over the barbarous and far distant continent of Australasia.

"But the Caucasian, or European race, have distinguished themselves from the other inhabitants of the world still more by the arts of peace—continued advancement in civilization—and successful cultivation of science and literature; and, in fact, it is to these studies, and to the results produced by them, that their superiority in arms is principally due."

See Sullivan, page 105—107, inclusive.

ENGLISH GRAMMAR.

SECTION I.

1. Make a table of the plural forms of nouns, and account for the *exceptional* forms.
2. What is meant by the cases of a noun? Give instances of the use of cases in the personal and relative pronouns.
3. Explain what you mean by moods and tenses in the verb. Show what real tenses the English verb has, and how its deficiencies of inflexion are supplied.

SECTION II.

1. Enumerate some of the principal prefixes and affixes used in the English language, distinguishing, as far as you can, those of Saxon from those of Latin origin.
2. Enumerate the principal figures of speech, giving instances.
3. Explain the origin of the words civil—urbane—artificial—individual—thoroughfare—gangway—Middlesex.

SECTION III.

1. On what do the number and person of the verb depend in a sentence? Give examples.

2. What parts are there in every proposition? Can any two of these parts be included in a single word? Give instances.
3. What is a principal, and what an accessory sentence? Give an example.

SECTION IV.

1. Parse the following sentence—

“Be humble—learn thyself to scan,
Know—pride was never made for man.”

2. Construct an English sentence in which the use of the nominative and objective cases of nouns is exemplified;—and explain the meaning of agent and object, in reference to the verb.
3. Express precisely, in simple prose, the following passage—

“Judge not what is best
By pleasure, though to nature seeming meet,
Created, as thou art, to nobler end
Holy and pure, conformity divine.
These tents thou saw'st so pleasant were the tents
Of wickedness, wherein shall dwell his race
Who slew his brother; studious they appear
Of arts that polish life, inventors rare;
Unmindful of their Maker, though his spirit
Taught them; but they his gifts acknowledged none.”

SECTION I.

1. “Make a table of the plural forms of nouns, and account for the exceptional forms.”

(1) The plural of nouns is generally formed from the singular, by the addition of *s* or *es*; as *book*, *books*; *fox*, *foxes*.

NOTE.—Nouns ending in *y*, preceded by a consonant, change *y* into *i*, and add *es*, to form the plural, without an increase of syllable; as, *lady*, *ladies*; *tory*, *tories*.

(2) The following nouns, ending in *f*, or *fe*, form their plural by changing *f* into *v* and adding *es*; *beef*, *calf*, *elf*, *half*, *knife*, *leaf*, *life*, *loaf*, *self*, *sheaf*, *shelf*, *thief*, *wolf*, *wife*. In accounting for this irregularity, Latham says, "In Anglo-Saxon, *f* at the end of a word was sounded as *v*; and it is highly probable that the original *singulars* were sounded *loav*, *halv*, *wive*, *calv*, *leav*." He then leaves the reader to infer that dwarf, gulf, and a host of others, which form their plural in the usual manner, are the exceptions rather than those above quoted. It is difficult to account for the anomalous fact, that some nouns in their plural, have followed the orthography, and others the original sounds of the words.

(3) A few nouns of Anglo-Saxon origin, form their plural by changing the vowel which precedes the other terminating letters: as *man*, *men*; *woman*, *women*; *foot*, *feet*; *tooth*, *teeth*; *goose*, *geese*: another class of similar words, by adding *en*; as *ox*, *oxen*; *brother*, *brethren*; *child*, *children*. Others are still more irregular; as, *die*, *dice*; *mouse*, *mice*; *louse*, *lice*; *penny*, *pence*. These irregularities may be traced to the original plural of the words before their adoption into the modern English; thus, the Anglo-Saxon plural was formed in *en* or *er*; and in the eastern counties, among the uneducated, a great disposition is still manifested for forming the plural in *en*; as in *housen* for *houses*; *hosen*, for *hose*. Among a similar class in the north, we invari-

ably hear eyne (een) for eyes : and in the agricultural parts of the midland counties, " my childer " is not at all infrequent.

(4) Many words introduced from the dead languages, retain their original plural ; as, *datum*, *data* ; *vortex*, *vortices* ; *criterion*, *criteria* ; *cherub*, *cherubim* ; &c.

Much interesting matter, closely allied to this question, might be appropriately introduced here, but our limits necessarily preclude its insertion. We may refer the reader to the work recently published by the Rev. J. Hunter ; also to Latham's and to Arnold's English Grammar.

2 " What is meant by the cases of a noun ? Give instances of the use of cases in the personal and relative pronouns."

The case of nouns or pronouns is the relation position in which they stand in respect to the other words with which they form a sentence. Our use of prepositions to indicate various circumstances in the condition of the noun, obviates the necessity of the numerous cases employed in some languages, as the six of the Latin, &c. In English there are but three cases, the Nominative, the Possessive, and the Objective. The Nominative is the subject or agent of the action expressed by the verb, and usually precedes the verb, as *James* strives. The Possessive indicates ownership, or possession, as *William's* book, *my* house. The Objective case is that form of the noun or pronoun which is *acted upon*, or is the object of a verb, or preposition, as, get *wisdom*, he is in *town*.

Instead of answering the requisites of the question literally, as would be done at an examination, the following neat arrangement of the personal and relative pronouns is extracted from Turner's Grammar.

FIRST PERSONAL PRONOUN.

MAS. OR FEM.

	<i>Sing.</i>		<i>Plu.</i>
Nom.	I	Nom.	We
Poss.	My, or Mine	Poss.	Our, or Ours
Obj.	Me	Obj.	Us

SECOND PERSONAL PRONOUN.

MAS. OR FEM.

	<i>Sing.</i>		<i>Plu.</i>
Nom.	Thou	Nom.	Ye, or You
Poss.	Thy, or Thine	Poss.	Your, or Yours
Obj.	Thee	Obj.	You

THIRD PERSONAL PRONOUN.

MASCULINE.

	<i>Sing.</i>		<i>Plu.</i>
Nom.	He	Nom.	They
Poss.	His	Poss.	Their, or Theirs
Obj.	Him	Obj.	Them

FEMININE.

NEUTER.

	<i>Sing.</i>		<i>Plu.</i>
Nom.	She	Nom.	It
Poss.	Her, or Hers	Poss.	Its
Obj.	Her	Obj.	It

NOTE.—The plural is identical for both genders, and also for the neuter.

RELATIVE PRONOUNS.

WHO, *applied to persons only.* WHICH, *applied to inferior animals and things.*

	<i>Sing. or Plu.</i>		<i>Sing. or Plu.</i>
Nom.	Who	Nom.	Which
Poss.	Whose	Poss.	Whose
Obj.	Whom	Obj.	Which

WHAT, *the compound relative, generally applied to things.* THAT, *applied to persons, animals, and things.*

<i>Sing. or Plu.</i>		<i>Sing. or Plu.</i>	
Nom.	What	Nom.	That
Poss.	—	Poss.	—
Obj.	What	Obj.	That

3. (1) "Explain what you mean by moods and tenses in the verb. (2) Show what real tenses the English verb has, and how its deficiencies of inflexion are supplied."

(1) Moods (Lat. *modus*, manner) are the different forms, or conditions in which the being, doing, or suffering denoted by the verb are expressed. Thus, when we make use of the word *write* under the form *to write*, the action is merely expressed without any limitation as to person or time; we use in that case the INFINITIVE MOOD. When we employ the form, *I write*, there is a limitation expressed—a simple declaration, or indication of action, and that action confined to a person; this is therefore termed the INDICATIVE MOOD. When we employ the form, *if he write*, the action is expressed as taking place at a future period under contingent circumstances, with conditions subjoined; this form is termed the SUBJUNCTIVE MOOD. In the expression, *write* (thou or you), or, *do you write*, the action to be performed is denoted by a request, or command; this form of the verb is termed the IMPERATIVE MOOD. These four are the only moods necessary to be recognised in English. The *Potential Mood* is almost obsolete, grammatically, though it is still partially retained, and some grammarians have carried their fantastical passion for classification to the extent of twenty-four moods!

Tense is the grammatical distinction of the time indicated by any part of the verb. We say *grammatical*

distinction, because the latter part of the question requires us to show that, in English grammar we have but a present and a past tense in verbs.

(2) In approaching the second part of the question we enter upon ground, if not more generally disputed, at least, more generally clung to than that to which reference has just been made—the mood potent; for although its *weakness* is acknowledged by Latham's silence upon that point, yet he who is bringing about a little revolution in the grammatical world, has obliquely and parenthetically recognised a Future Tense. That a future time may be spoken of, and looked for *no one will deny*; but that the naked simplicity of the conjugation of an English verb has, or requires it, is another thing. We already hear some readers saying, "The subject cannot be referred to without using the future tense; otherwise, what means *no one will deny*?" Here, then, in the outset, it is asserted that "no one will deny" is no more future than the phrase, "we already hear," &c. And, again, "no one will deny" that *we hear* is present. But mere assertion will not establish the point. The verb *deny* expresses of itself no limitation of any nature whatever—in short, it is in the Infinitive Mood. The difficulty, if such there be, rests, therefore, wholly with the verb *will*. Now if that word is thought of in regard to its signification, it will be seen to contain within itself at least two distinct ideas, *determination* and *futurity*. Would it not be just as consistent to manufacture a new mood—say Determinative Mood—to meet the requisites of the former of these meanings, as to retain a *future tense* for the latter? Perhaps our sterile English is wanting in point of euphony, in expressing futurity, when compared with the sonorous *future tense* of our neighbours; but surely we do not improve euphony of the expression merely by giving it another and erroneous

name. We do not intend to say there is no advantage in making a boy acquainted with what is called our future tense, if he is to be taught Latin or French ; but even this is a debatable point. Query—Will he not just as soon comprehend and learn the Latin tenses, by having the wide difference between them and ours pointed out, as by having been taught a mere ideal tense in English for the sake of analogy ?

The “real tenses” then in an English verb are the *present* and the *past* ; as, walk, walked ; sing, sang.

The remaining four so-called tenses are compounded as follows :—The future is formed by prefixing the auxiliaries *shall* or *will* to the infinitive—as, I shall or will love ; the perfect, similarly, by placing *have* before the infinitive—as, I have learned ; the pluperfect, by placing *had* before the infinitive—as, I had gone ; the future-perfect (or second future, or future anterior), by prefixing *shall* or *will have* to the infinitive—as, we shall have finished soon.

SECTION II.

1. “Enumerate some of the principal prefixes and affixes used in the English language, distinguishing, as far as you can, those of Saxon from those of Latin origin.”

The importance of a knowledge of the Latin, Greek, and Saxon prefixes is so generally understood, that in preference to giving examples, as required by the question, we shall recommend the reader to commit to memory a complete list of these in the form usually prefixed or appended to elementary reading-books. Outlines of Etymology, by the Rev. A. Wilson, and Ross’ Little Manual, should be in the hands of all teachers.

2. “Enumerate the principal figures of speech, giving instances.”

The figures of speech may be divided into three classes—viz., those of Etymology, those of Syntax, and those of Rhetoric.

FIGURES OF ETYMOLOGY.—1. *Aphæresis*; as, 'neath = beneath. 2. *Apocopé*; as thro' = through. 3. *Syncopé*; as, o'er = over. 4. *Prosthesis*; as, evanished = vanished. 5. *Paragoge*; as deary = dear. 6. *Diæresis*; as, æronuut, not æronaut. *Synæresis*; as, drowned, not drown-ed. 8. *Tmesis*; as, what man soever = whatsoever man.

FIGURES OF SYNTAX.—1. *Ellipsis*; as, the upper and the lower house = the upper house and the lower house. This figure may be applied to any part of speech, participle, or even to a clause. 2. *Pleonasm*; as, "I know thee who thou art" = I know thee. Pleonasms must be used sparingly. 3. *Syllepsis*; as, "While *Evening* dawns *her* crimson curtain round." 4. *Enallage*; as, "Sure some disaster has *befel*" (be-fallen). 5. *Hyperbaton*; as, he wanders *earth around* (around the earth).

FIGURES OF RHETORIC.—These are fourteen in number; 1. *Simile*, 2. *Metaphor*, 3. *Allegory*, 4. *Metonymy*, 5. *Synecdoche*, 6. *Hyperbole*, 7. *Vision*, or *Imagery*, 8. *Apostrophe*, 9. *Personification*, 10. *Erotesis*, 11. *Antithesis*, 12. *Ecphonesis*, 13. *Climax*, 14. *Irony*; as, 1. "Thy voice is sweet as seraph's song." 2. "Speechless and fix'd in all the *death of woe*." 3. "Thou hast brought a vine (a people) out of Egypt." 4. "The sceptre (kingly power) shall not depart from Judah." 5. "This *roof* (*house*) protects you." 6. "Trembling Tiber *dived beneath his bed*." 7. "I already hear the reader saying, &c." 8. "Death is swallowed up in victory. *O Death where is thy sting?*" 9. "When *Music*, heaven-born *maid*, was young?" 10. Hast thou an arm like God?" 11. Though *deep*, yet *clear*; though *gentle*, yet not *dull*, o'erflowing stream." 12.

"*O, Liberty!* so fruitlessly sought by the sons of France;" 13. (2 Peter, 1 v.) 14. "Yes, Sir; I see I'm mistaken; I thought I had been occupying the seat of a Christian and a gentleman" (Reply of a person who was abruptly and rudely informed that he had made a mistake in respect to his pew). The preceding are chiefly from Turner's Grammar.

NOTE.—We have here complied with the requisites of the question, which is all that would be done at an examination; but, of course, to do that thoroughly at such a time a complete acquaintance with the Figures of Speech is necessary, which can only be obtained by more extensive study than our work will afford space for as a text-book.

3. "Explain the origin of the words—civil, urbane, artificial, individual, thoroughfare, gangway, Middlesex."

Civil (Latin, *civis*, a citizen); the extensive application of this adjective, and the various shades of meaning that it has gradually acquired, may be traced to its primitive use as expressive of the qualities possessed by, or looked for in, the citizen.

Urbane (Latin, *urbānus*, belonging to a city—*Urbs*, a city); applied in some of the senses of civil, when the shade of difference between the words is scarcely perceptible.

Artificial (Lat. *artificium*, a thing made by art—*ars*, art; and *facio*, I make); this word retains its etymological signification—belonging to operations of art, opposed to those of nature.

Individual (Latin *individuus*, inseparable—*in*, not: *divido*, I divide): this word is used both as an adjective, when it retains its original meaning, and as a substantive, when it means a single being opposed to the specie.

Thoroughfare (Saxon, *thurh*, through and *faran*, to go); thus, the word in its application combines the two roots, and means a passage through without stop or hindrance—a public road.

Gangway (Saxon, *gang*, a going, and *weg*, a passing, a way.) This word, in its literal signification, is similar to thoroughfare; but it has a more limited application, being applied to the passage from one part of a ship to another.

Middlesex (Saxon, *middel*, intermediate, and *Sex*, from the Saxon, of which the root is *seax*, a sword.) Applied to that portion of England which formed about the centre of the district conquered by the Saxons, Angles, and Jutes, during the early part of their invasion.

SECTION III.

1. "On what do the number and person of the verb depend in a sentence? Give examples."

The subject of a verb must be put in the nominative case; and the verb must agree with its subject or nominative in number and person (See Rules of Syntax). The English verb does not change its actual form to express number and person to the same extent as verbs of ancient or modern languages in general; this is exhibited in the conjugation of the verb *to love*, as follows; the present indicative merely is exemplified, as that is sufficient to show the two numbers and the three persons.

<i>English.</i>	<i>French.</i>	<i>Italian.</i>	<i>Latin.</i>
SINGULAR.			
I love,	= j' ame,	= amo,	= amo,
Thou lovest,	= tu ames,	= ami,	= amas,
He loves;	= il ame;	= ama;	= amat;

<i>English.</i>	<i>French.</i>	<i>Italian.</i>	<i>Latin.</i>
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PLURAL.

We love,	= nous amons,	= amiamo,	= amamus,
You love,	= vous aimez,	= amate,	= amatis,
They love.	= ils ament.	= amano.	= amant.

This table exhibits the general wide difference between the inflexion of our verb and that of other languages of Latin origin. The remark, however, is not applicable to the auxiliary verbs *Have* and *Be*. These, in every language, undergo greater modification than most other verbs. In the bulk of our verbs, the only change is in the second and the third persons singular; the former of which is obsolete, and the latter, by the uneducated, is often treated as a superfluous exception to the uniform regularity of inflexion. It should be said, however, that this is chiefly an East-Anglianism; for, elsewhere, the opposite custom obtains. Thus, a Norfolk man might be recognized by such a phrase as, "He love."

2. "What parts are there in every proposition? Can any two of these parts be included in a single word? Give instances."

A proposition consists of *three* parts; (1) the thing spoken of, or *Subject*; (2) that which is said of it, or the *Predicate*; and the connecting link between the Subject and the Predicate, called the *Copula*. The *Copula* and *Predicate* can be included in a single word: as, *man lives*; here *man* is the Subject, and the verb *lives* contains the two parts in question, and may be resolved thus, *man is living*: *is*, the connecting part, is the *Copula*, and *living*, the *Predicate*. It is not necessary that any of the three should consist of one word only; a clause may become the Subject, another the Predicate, and a combination of verbs the *Copula*; as,

("The weak practise of employing espionage) (can never be imputed to) (a wise and able minister)."

See Latham.

3. "What is a principle, and what an accessory sentence? Give an example."

A sentence, or a succession of sentences may contain several propositions; but that sentence, or portion of a sentence, which conveys the subject discussed or referred to in a distinct proposition, is the *principal sentence*; while those propositions which obliquely convey explanatory matter in the form of adjuncts constitute *accessory sentences*.

Example.—"In his last moments he uttered these words, 'I fall a sacrifice to sloth and luxury.'" Here the principal sentence consists of two propositions—"I fall," &c. The adjunct clause—"In his last moments;" and the minor proposition—"he uttered these words," make up an *accessory sentence*. This example contains the principal and accessory parts in the same sentence. In the following example it is otherwise:—

"The selfish man languishes in his narrow circle of pleasures. They are confined to what affects his own interest. He is obliged to repeat the same gratifications till they become insipid. But the man of virtuous sensibility moves in a wider sphere of felicity." Here the first three sentences are *accessory* to the fourth, the *principal*. Sentence, as used in the question, has a more technical application than that which attaches to it ordinarily.

SECTION IV.

1. "Parse the following sentence:—

"Be humble—learn thyself to scan;

Know—pride was never made for man."

<i>Be</i>	An intransitive verb, second person singular, imperative mood.
<i>Humble</i> —	An adjective, positive degree, limiting person understood. (The expression, <i>Be humble</i> = <i>Be a humble person</i> .)
<i>Learn</i>	A transitive verb, second person singular, imperative mood.
<i>Thyself</i>	A compound personal pronoun, second person singular, masculine or feminine gender, objective case, governed by the transitive verb <i>to scan</i> .
<i>To scan</i> ;	A transitive verb, infinitive, governed by <i>learn</i> .
<i>Know</i> —	A transitive verb, second person, singular, imperative mood.
<i>Pride</i>	A noun, singular, neuter, nominative to <i>was</i> or <i>was made</i> .
<i>Was</i>	An intransitive verb, third person, singular, past indicative, agreeing with its nominative, <i>pride</i> .
<i>Never</i>	An adverb of negation, limiting <i>was</i> or <i>was made</i> .
<i>Made</i>	The perfect participle of the transitive verb <i>to make</i> .
(<i>Was made</i>)	A passive verb, third person, singular, past, indicative agreeing with <i>pride</i> .
<i>For</i>	A preposition, governing <i>man</i> .
<i>Man</i>	A noun, singular, masculine, objective, governed by the preposition <i>for</i> .

NOTE.—It is far from our intention to suggest the above as the best mode of parsing. Most persons have some favourite methods ; but brevity and expressiveness should be the aim of all.

2. (1) “ Construct an English sentence in which the

use of the nominative and objective cases of nouns is exemplified; (2) and explain the meaning of agent and object in reference to the verb."

(1) This sentence itself will answer its requisites. The first noun, "sentence" is in the objective case, governed by *construct*; the second, "use" is the nominative, or agent to the verb "is;" the third and fourth, "cases" and "nouns," are in the objective, governed by the preposition "of;" "meaning" is a present participle used as a noun, and governed in the objective case by the transitive verb *explain*; the next, "agent," "object," "reference," "verb" are all in the objective case. Other instances of these cases might occur; as, the nominative addressed, the nominative or objective by apposition.

(2) The agent and object of a verb are respectively the nominative and objective cases of nouns. A noun, however, that is objective after a transitive verb can only be the object in reference to the verb. Every nominative, whether a word or a clause, is the agent of the verb; and is so termed because it is the word or clause of which the action, &c., denoted by the verb, is expressed (Latin, *agens*, participle, doing). The agent and object of the verb are exhibited in the following sentence—"Honest *industry* produces honourable *competence*."

3. "Express precisely, in simple prose, the following passage:—

"Judge not what is best

By pleasure, though to nature seeming meet,

Created, as thou art, to nobler end,

Holy and pure, conformity divine;

These tents thou saw'st so pleasant were the tents

Of wickedness, wherein shall dwell his race

Who slew his brother; studious they appear

Of arts that polish life, inventors rare,
Unmindful of their Maker, though his spirit
Taught them; but they his gifts acknowledged none."

No object would be served in transposing this passage from Book xi. of *Paradise Lost*; it is entirely a matter for the exercise of individual taste. Every one, especially the teacher, is aware of the necessity of attending closely to rhetorical construction, and to the study of standard poetical works, such as that from which the preceding passage is extracted.

ENGLISH LANGUAGE.

SECTION I.

1. What is the earliest language of Great Britain of which we have any knowledge? What language succeeded, and what others have become incorporated with the latter?
2. In what parts of England did the ancient language longest survive; and where in Great Britain is it still spoken?
3. Give the derivations of the conjunctions "if"—"unless"—"since"—"lest"—and state the reasons for your opinion.

SECTION II.

1. To what family of languages does the Welsh belong, and in what other peoples' are kindred forms of speech prevalent?
2. Put the following into modern phrase:—

"I had *as lief* not be as live to be
In awe of such a thing as I myself."——

"For which they were as glad of his commynge
As foule *is faine* when y^e sonne upryseth."

"*Belike* they had some notice of the people
How I had moved them."

Explain and derive the words in *italics*.

3. Account for the following terminations of names of places:—"caster," "chester," "don," "ton" "ley," "leigh," "ly," "wick," "bergh," "burgh," "bury," "borough," "field," "feld," "by," "bey," "kirk," "hythe," "combe," "thorp," "fold," "wold," "toft"—and give instances to illustrate your opinion.

SECTION III.

1. By what historical events has the composition of our language been chiefly influenced?
2. What are the principal metres in which our best poets have written? Give instances of each.

SECTION IV.

1. Mention any books that you conceive to have had a greater influence than others upon our language.
2. Give some account of the life and writings of any one of these writers—viz., Chaucer, Shakspeare, Bacon, Milton, Hooker, Addison, Samuel Johnson, Cowper, Walter Scott.

SECTION I.

1. "What is the earliest language of Great Britain of which we have any knowledge? What language succeeded, and what others have become incorporated with the latter?"

The earliest language of which historical records make mention as having been spoken in Britain, is that which we call Welsh, and which the Welsh call Cymreig, or the language of the Cymry. It is a Celtic dialect, having many points of affinity and identity with the Gaelic,

Irish, Manks, and Armoric. It was displaced by the Anglo-Saxon, the basis of modern English, whose other constituents are French, Latin, Greek, and a few foreign words introduced by political, commercial, or literary intercourse."

2. "In what parts of England did the ancient language longest survive; and where in Great Britain is it still spoken?"

Cornwall, Cumberland, and the western part of the Welsh Marches—but especially Cornwall—retained, till comparatively recent times many traces of the language of the Aboriginal Celtic population of our island. It still survives as the vernacular tongue of the inhabitants of Wales, but is becoming slowly supplanted by English.

3. "Give the derivations of the conjunctions 'if'—'unless'—'since'—'lest'—and state the reasons for your opinion."

If is from *gif* (the Saxon imperative of the verb *gifan*, to give), signifying *grant*, *allow*, *give*. In using *if* we claim a concession as the condition on which the proposition rests which we are about to enunciate.

Unless is from *onles* (imperative of *onlesan*), signifying dismiss, except. Its synonyme is except—i.e., put aside, or leave out.

Since is derived from *siner* or *syne* (perfect participle of *seon*, to see), and signifies seeing, or seen.

Lest is from *leas* (perfect participle of *lesan*), signifying dismissed, that less.

SECTION II.

1. "To what family of languages does the Welsh belong, and in what other peoples' are kindred forms of speech prevalent?"

See answer to question 1. section i.

2. "Put the following into modern phrase:—

- (a) { "I had *as lief* not be as live to be
In awe of such a thing as myself.'———
- (b) { "For which they were as glad of his commynge
As foule *is faine* when y^e sonne upryseth.'
- (c) { "Belike they had some notice of the people
How I had moved them."

(d) "Explain and derive the words in *italics*."

(a) I would as willingly not be (or live) as live, &c.

(b) { For which they were as glad of his coming
As the feathered race is rejoiced at sun-rise.

(c) Probably they had some notice, &c.

As is from Ger., als (Pers. *asa*), like, similar.

Lief is pure Saxon, meaning, literally, loved dear, beloved; its conventional meaning is, gladly, willingly, freely.

Is is pure Saxon of the same import as in English.

Faine is from Saxon *fagan*, to rejoice; its common signification is, glad, pleased, rejoiced.

Belike is from the Saxon prefix *be*, meaning *by*, and *lic*, similar, or like. Hence, *belike*, now obsolete, signifies, by likelihood, probably, perhaps.

3. "Account for the following termination of names of places:—'caster,' 'chester,' 'don,' 'ton,' 'ley,' 'leigh,' 'ly,' 'wick,' 'bergh,' 'burgh,' 'bury,' 'borough,' 'field,' 'feld,' 'by,' 'bey,' 'kirk,' 'hythe,' 'combe,' 'thorp,' 'fold,' 'wold,' 'toft'—and give instances to illustrate your meaning."

"Caster" and "chester" are from *castra* (Latin, a camp); and names of places with these terminations have been the sites of Roman military stations—e.g., Doncaster, Manchester, &c.

"Don" is a variation of *dun* (Celtic, a hill); as Snowdon. "Ton" is a short form of *town*, and has the same signification; as Castleton. "Ley," "leigh," and "ly," are different forms of the same word (from Saxon, *leay*, a meadow); as Burnley, Leighton, and Leytonstone. "Wick" is from Saxon *wic*, a village (or, Latin, *vicus*, a street); as Warwick. "Bergh," "burgh," "bury," and "borough," are different forms of the same word, which is derived from *beorgan*, Saxon, to make close, or secure—hence the application to a city, or town; as Sedbarg, Roxburgh, Neabury, Bamborough. "Field" and "feld" are from Saxon and German, *feld*, level land, a plain; as Litchfield. "By" and "bey" are from Danish, *bye* a village, or town; as Whitby. "Kirk" is from Saxon, *circ* (sounded kirk), pertaining to a lord—hence the application, a church, a house, pertaining to the Lord; as Kirkpatrick. "Hythe" is Saxon, a port, or harbour; as Queenhithe, Hythe. "Combe" signifies a valley; as Nettlecombe. "Thorp" means a habitation, a village; as Kingsthorpe, Thorp. "Fold" signifies doubled; as in Cawfold, Kinfold. "Wold" is another form of Saxon, *wald* and *weald*, a wood; as Southwold. "Toft" means a collection of small things in a knot; as Lowes-toft. See Webster's Dictionary.

SECTION III.

1. "By what historical events has the composition of our language been chiefly influenced?"

The English tongue is very little indebted to the language of the original inhabitants, whom the Saxons displaced, or exterminated. History affords no parallel to the extremely slight degree of amalgamation between the speech of the conquerors and that of the conquered, which is presented in the case of the Saxons

and the Britons. The appellations of some rivers and hills are almost the only traces existing in the English language of that speech which preceded it in currency, when Britain was a remote province of the Roman Empire. The numerous colonies of Danes, whose successful invasions enabled them to obtain a footing in large districts in England, left the impress of their speech, as our works on derivation amply testify. The Norman invasion brought a new language to commingle with that of our Saxon progenitors; but despite every effort that policy and tyranny could bring to bear for the suppression of the language of the vanquished, it retained its ground, and eventually gained the ascendancy, though not without the gradual absorption of much of the speech of the conquerors. Nearly two centuries elapsed before Norman-French was well grafted on the original stock. Later modifications can scarcely be referred to any great historical events, but character is concisely estimated by Webster, in the following extract:—

“ Since the invention of printing changes in the language have been less rapid than before; but *no art nor effort* can completely arrest alterations in a living language. The distinguished writers of the reign of Elizabeth improved the language, but could not give it stability. Many words, then in common use, are now obsolete, or have suffered a change of signification. In the period between Queen Elizabeth and the beginning of the eighteenth century, the language was improved in grammar, orthography, and style. The writers in the reign of Queen Anne and George I. brought the language nearly to perfection; and if any improvement has been since made it is in the style, or dictation, by a better selection of words, and the use of terms in science and philosophy with more precision.”

2. "What are the principal metres in which our best poets have written? Give instances of each."

The following reply is compiled from Latham on the English Language. See, also, the more accessible English Grammar of the same author.

The number of the English measures is five, of which two are dissyllabic, and three trisyllabic.

Taking *a* to represent an accented syllable, and *x* an unaccented one, *a x*, and *x a*, are the dissyllabic measures. Similarly, the trisyllabic measures are symbolised by *a x x*, *x a x*, *x x a*, and the five measures stand thus:—

- | | |
|--|----------------|
| 1. <i>a x</i> ; as tyrant, stupid | } Dissyllabic. |
| 2. <i>x a</i> ; as presume, deter | |
| 3. <i>a x x</i> ; as merrily, angrily | } Trisyllabic. |
| 4. <i>x a x</i> ; as disable, preferring | |
| 5. <i>x x a</i> ; as refugee, cavalier | |

Until the above simple mode of classification was suggested by Dr. Latham, the usual names of the measures as they stand, were, Trochees, Iambies, Daetyls, Amphibrachs, and Anapests, in imitation of classical feet; in which application accents in English are made to correspond with quantity in the classical tongues.

The measure *x a* enters more largely than any other into English verse. Four measures of *x a*, or *x a x 4*, constitute *Octosyllabic Metre*, as,

"Could tell by *sine* and *tangent* straight,

If bread or butter wanted *weight*."

Hudibras.

The "Lay of the Last Minstrel," and other poems of Scott, and Byron's "Giaour," are in the same metre.

1. *Common Octosyllabics* is the name of such couplets as the above specimens.

2. *Elegiac Octosyllabics* are like the preceding, except that alternate lines rhyme and the verses are arranged in stanzas; Tennyson uses it.

3. Signs of $x a \times 3$, with alternate rhymes, constitute *Gay's Stanzas*; as,

"When o'er the white wave stooping,
His floating corpse she spied;
Then, like a lily drooping,
She bowed her head and died."

Ballad, by Gay, in "What-do'ye-call-it."

4. *Octosyllabic Triplets* are formed of three rhymes in succession, usually arranged in stanzas; as,

"Then shall, with universal dread,
The sacred mystic book be read,
To try the living and the dead."

Day of Judgment, by Roscommon.

Tennyson employs the same metre.

5. *Blank Verse* consists of $x a \times 5$ without rhyme. Milton, Shakspeare, Young, and Cowper, use this.

6. *Heroic Couplets* are formed of $x a \times 5$ with pairs of rhymes. This is the common metre for didactic, narrative, and descriptive poetry.

"Tis hard to say if greater want of skill
Appear in writing, or in judging ill."

Essay on Criticism.—Pope.

Chaucer, Denham, Dryden, Waller, Cowper, Goldsmith, Byron, Moore, Shelley, and most of our poets, afford specimens of this metre.

Heroic Triplets consist of formula $x a \times 5$ with three rhymes in succession, arranged in stanzas, same

as preceding, except that three rhymes, instead of two, come in succession.

8. *Elegiacs* ($x a \times 5$), of which Gray's *Elegy* is an exquisite specimen.

9. *Spenserian Stanza*: it consists of eight lines of heroics, closed by an Alexandrine, which is $x a \times 6$. The "Faery Queen" of Spencer, and Byron's "Child Harold," &c.

10. *Service Metre* ($x a \times 7$) *Common Measure*, or, *Long Measure*. See *Psalms*.

11. *Ballad Metre*, as, "Chevy Chase," "Edwin and Angelina," &c. The other English metres are numerous, but few of them are named. *Ottava Rima*, and, *Terza Rima*, are borrowed from the Italian.

See Latham's *English Grammar*, second edition.

Guest's *History of Metres*, and some observations of Coleridge prefixed to his *Christabel*.

SECTION IV.

1. "Mention any books that you conceive to have had a greater influence than others upon our language."

Wickliffe's *English Writings*, and especially his translation of the *Scriptures*, contributed, in no mean degree, to promote the progress of the English language. Chaucer's *Poetry* exhibits a polish and harmony to which none of his predecessors can lay claim. He likewise augmented his native vocabulary by the introduction of numerous foreign words. The sermons, translations, and other compositions of our great reformers and their contemporaries, improved the character of our language for literary permanence and consistency. Latimer, Fox, Tyndal, Coverdale, Ascham, and More, deserve honourable mention on this score.

The poetry of Spencer, when divested of its antique orthography, evidences still further improvement in the language. The transcendent genius of Shakspeare finally relieved our language and literature from disparaging contrast with those which had attained an earlier maturity. Ben Jonson, Massinger, Beaumont, Fletcher, Hooker, Bacon, Raleigh, Selden, Usher, Jeremy Taylor, and a host of others: each in the department to which his genius prompted him, signalized the period between Elizabeth and the Commonwealth, added to the copiousness and grace of our language, and secured a European reputation for our literature. The succeeding century is illustrated by a perfect galaxy of brilliant names, to each of whom our language and literature is, in some way, indebted. Waller added to the smoothness and refinement of English poetic diction; Milton immortalized our literature, and took rank with the greatest poets of all time; Dryden shone in varied but equally happy styles of composition; the quaint Fuller added to our prose a vast fund of pithy good sense and sagacity; Izaak Walton followed in a similar track of quaint fancies and wise thoughts; Barrow took first rank among profound yet popular theological writers; Tillotson, Stillingfleet, Sherlock, South, Wilkins, Pearson, Burnet, Bunyan, and many more were equally successful in similar literary labours. Sir William Temple has the reputation of being one of the chief polishers of the English language; Johnson said of him that he was the first writer who gave cadence to English prose. His compositions are of a miscellaneous kind, chiefly essays. Prior, Addison, Swift, Pope, Gay, Congreve, Steel, Defoe, Thomson, Young, Johnson, Grey, Goldsmith, and a host of almost equally illustrious names, introduce us to refined and classic English, such as no contemporary can aspire to excel.

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2. "Give some account of the life and writings of any of these writers, viz., Chaucer, Shakspeare, Bacon, Milton, Hooker, Addison, Samuel Johnson, Cowper, Walter Scott."

A fair reply to this query would occupy many pages, and the matter can be obtained through many accessible channels. It is therefore left unanswered.

ENGLISH HISTORY.

SECTION I.

1. What monuments and works have been left in this country by the Britons and Saxons?
2. Enumerate the kingdoms established by the Anglo-Saxons, describing, in general terms, their relative positions.
3. What existing institutions are derived from the Anglo-Saxons? Describe them briefly.

SECTION II.

1. Arrange the following battles in the order of time—Hastings, Bosworth, and Worcester; and state the immediate results of each.
2. What circumstances led to the signing of Magna Charta? State its chief provisions.
3. State some of the principal circumstances attending the establishment, or introduction, of the present chief manufactures of England.

SECTION III.

1. State the circumstances which led to the introduction of the Potatoe, Tobacco, Cotton, and Tea.
2. Give some account of the authority exercised by the Pope in England before the Reformation; and of the troubles which, at different times, arose in consequence.
3. State the difference between the habitations, fuel, food, and clothing of the poorer classes of people

in the reigns of Alfred, of Elizabeth, and of Victoria.

4. State the circumstances under which the following places were annexed to the British Dominions;—Jamaica, Gibraltar, Canada.

SECTION IV.

1. Illustrate the growth of the naval power of this country by reference to its most remarkable engagements at sea, and to their consequences.
2. Under what circumstances was Scotland united to England; and what were the most important terms of the union.
3. State the difference in what were considered the necessary accomplishments of a person of fortune in the times of Alfred, of Edward III., of Elizabeth, and of Victoria.
4. Give a brief account of the leading political events, and enumerate the most distinguished statesmen of the reign of George III.

SECTION I.

1. "What monuments and works have been left in this country by the Britons and Saxons?"

Our existing memorials of the British period are numerous tumuli or barrows, of which Salisbury Hill, in Wiltshire, is thought to be one, though its colossal dimensions almost preclude the hypothesis; some specimens of fortification and castrametation, as the British Camp on the Malvern Hills, better known as the Hereford Beacon; remains of Druidical temples, of which Stonehenge and Abury are the most conspicuous;

canoes of rude workmanship, formed of hollowed trunks of trees, of which a good specimen is preserved at the British Museum; spear-heads, and other fragments of arms and armour; coins and ring money.

The Saxon period, being subsequent to the British and of growing civilization, affords more numerous mementoes. Of these, its architectural monuments, few of which however are well authenticated, may be first mentioned. Among the undoubted specimens are Edward the Confessor's Chapel, Westminster Abbey; Lindisfarne Abbey; Holy Island; Earl's Barton Church, Northamptonshire; Bamborough Castle, Northumberland; the parish church of Darent, in Kent, &c., &c.

The eighth, and several succeeding centuries, were prolific in Anglo-Saxon works of caligraphy and illumination, an art that was fostered and developed in the Cloister. These quaint and remarkable illustrations give the chief value to the ponderous volumes of manuscript that form the pride and glory of our museums, and that would be cheaply purchased for their weight in gold. Among such illustrations are remarkable initials, composed by the interlacing of foliage with birds, serpents, &c.; elaborate representations of historical and domestic events; representations of national spirits, costume, industrial occupations, the minutiae of feasts and religious festivals and ceremonials; and many of them in such consecutive and serial arrangements as almost to imply a disposition to cater for the tastes of after and inquiring ages. Saxon coins are generally of a rude workmanship, a circumstance which has been thought to indicate that our ancestors were not indebted for their knowledge of coining to the imitation of Roman models. (For extensive information on these and similar points, see Knight's Pictorial History.)

2. "Enumerate the kingdoms established by the Anglo-Saxons, describing, in general terms, their relative positions."

The first was Kent, established by Hengist, after long hostilities, which commenced in 449; the second, Sussex, or the South Saxons, founded by Ella, in 477; it included the present counties of Sussex and Surrey; the third, Wessex, or the West Saxons, was founded shortly after by Cerdic, and included Hampshire, the Isle of Wight, and a varying portion of the neighbouring counties to the north and west; the fourth was Essex, or the East Saxons (with part of Hertfordshire and Suffolk), founded 527—29, by Ercenwine; the fifth was Northumbria (composed by the union of two smaller ones, Berenicia, established by Ida, 547, and Deira, somewhat later), in which were Northumberland, Durham, Yorkshire, and Lancashire; the sixth was East Anglia, the present Norfolk and Suffolk; the seventh, and most extensive, was Mercia, extending from the Thames to the Severn, and the Humber. The boundaries of the kingdoms of the Heptarchy, were subject to continual fluctuation, according to the fortune of war.

3. "What existing institutions are derived from the Anglo-Saxons? Describe them briefly."

We trace among the Saxons, as among the other Germanic tribes, the germs of three great institutions, from whose well-balanced and co-operative development we derive the leading feature of our present government. 1. Assemblies of freemen; in which affairs of national importance were debated. 2. Kings, hereditary or elective, in the times of our Saxon ancestors. 3. The principle of an aristocratic leadership, either of a military chief over his companions in arms, or of a landed proprietor over his dependents (Course of His-

tory, vol. ii. page 268. Guizot). Tithings, hundreds and counties, or shires, were territorial divisions of the Saxons. From the earl or alderman of the shire we have our lord-lieutenants; and from the deputies of the alderman our sheriffs. The wittenagemot was the original of our parliament. Trial by jury is considered to have existed among the Saxons, but grave objections are advanced against the opinion, chiefly on the ground of the well-known paramount ascendancy of the ordeal. Until comparatively recent ameliorations were effected in our criminal code, it bore strong traces of its derivation from the old Anglo-Saxon legal punishments, among which were fines, death, imprisonment, outlawry, banishment, slavery, transportation, whipping, branding, the pillory, amputation of limb, mutilation of the nose, ears, and lips, plucking out of the eyes, and tearing off of the hair.

SECTION II.

1. "Arrange the following battles in the order of time:—Hastings, Bosworth, and Worcester; and state the immediate results of each."

The Battle of Hastings occurred on the 14th of Oct., 1066. Its results were the subversion of the Saxon dynasty, and the acquisition by the Norman victors of all the fruits of conquest—government, landed-property, and priority in all the distinctions of civilized life.

The Battle of Bosworth Field was fought on Aug. 22, 1485, and secured the final ascendancy of the Lancastrian party, after a protracted and desolating civil war of nearly thirty years duration. Richard III. (House of York) was killed in the battle; Richmond became king, under the title of Henry VII., and strengthened his claim by his marriage with the princess Elizabeth, sister of the murdered princes Edward V. and the Duke of York.

The Battle of Worcester took place on Sept. 3, 1651. In it the royalists sustained a final and disastrous defeat, the annihilation of every prospect of success in competition with the genius of the ever-successful Cromwell. It was the last of a great series of victories by which the Commonwealth was established and consolidated.

2. "What circumstances led to the signing of the Magna Charta? State its chief provisions."

The tyranny, cruelty, and treachery of King John's Charter were the proximate causes that gave rise to the Great Charter. His total want of honourable feeling had been frequently tested by his breach of word to the confederate barons whom his rapacious cruelty and vindictiveness had driven into a defensive league against him. To avert the consequences of an interdict, John made a most abject submission to Pope Innocent III., swore allegiance to him, and agreed to hold his kingdom as a fief of the holy see. His subjects had in no way been consulted as to this disposition of themselves and their country, and their universal feeling of indignation, soon sought a way of vindicating their violated rights. The leading men of the kingdom, lay and clerical, banded themselves together, drew up a charter of privileges, and demanded of the king a solemn acceptance of its provisions. With much reluctance John signed this great bulwark of popular liberties at Runnemedede, near Staines, on the 19th of June, 1215. Its more important concessions were:—1. No aids or subsidies were to be levied upon the subject, without the consent of the great council of the nation. 2. All men to be allowed to pass from, and to return to the kingdom at their pleasure. 3. The estate of every freeman to be regulated by his will. 4. The King's court to be stationary, and open to all. 5. No person to be tried

on suspicion alone, but on the evidence of lawful witnesses. 6. No person to be tried or punished but by the judgment of his equals (a jury), and the law of the land.

3. "State some of the principal circumstances attending the establishment or introduction of the present chief manufactures of England."

The introduction of our great textile manufactures of cotton and woollen goods as distinguishing national occupations, resulted from Edward the Third's marriage with the Flemish princess, Philippa of Hainault. The close alliance thus brought about between England and Flanders, led Edward, in 1331, to invite a colony of Flemish clothiers into this country, and under the favourable auspices of the royal protection, they soon became a thriving body. They settled at Bolton, and there introduced the processes of spinning and weaving. The revocation of the Edict of Nantes (a sort of charter of toleration to Protestants), in 1685, drove many industrious artizans from France into our large towns. Vast numbers of these were weavers of silk and woollen goods; Spitalfields, and the towns of Lancashire and Yorkshire, were the localities of their settlement. The use of wooden clogs, in the last named counties, dates from the arrival of the Flemish clothiers; and the numerous French names among the weavers of Spitalfields, is a standing memorial of the bigotry of Louis XIV. Before the time of Edward III., the principal export of England was wool; pasturing and grazing were the chief occupations of our agricultural population. Even in 1354, as appears from an Exchequer record, wool constituted thirteen-fourteenths of the whole value of the exports of the kingdom. From that period the system has been gradually reversed, till we have become the greatest importers of raw wool;

and the increased value of land consequent on the accumulation and increase of population, has led to the appropriation, for the production of grain, of a large proportion of the land that was previously in grass, or totally uncultivated.

The first authenticated case of the manufacture of cotton goods in England was in 1641, when we borrowed the crude methods of Italy. Before this, the only cottons known, were imported from the East Indies. Nor was it till 1760 that we exported any considerable quantity of the products of our looms. As soon as a demand for them arose abroad, the manufacture received a corresponding impulse. The thread had hitherto been spun entirely, as it still continues to be, in India, by the tedious process of the distaff and spindle. But the total inadequacy of this domestic manufacture to the supply of the growing demands of our export trade, soon induced numerous attempts to contrive some more effective method of spinning than that which had hitherto sufficed. A host of inventors sprang up almost simultaneously, but Arkwright, of Preston, and Kay, of Bury, are the names most prominently associated with the application of machinery, properly so called, to weaving and spinning. The use of steam-power as a prime mover of machinery (1785) gave a grand impetus to the cotton manufacture. The gradual advance of this great branch of our national industry, is strikingly illustrated by a reference to the amount of raw cotton imported at different periods. At the beginning of the last century this was less than 2 million pounds annually; in 1780, it was between 6 and 7 millions; in 1800, it had realized 56 millions; in 1825, 228 millions; and at the present time it ranges between 300 and 400 millions of lbs. Our exports of cotton goods now nearly equal all our other exports put together. In 1760, not more than 40,000 persons

were employed in the cotton manufacture, which now engages more than a million persons.

The French Protestant refugees brought with them the hand-loom weaving of silks. In 1717, the first silk mill, which is yet in operation, was erected at Derby, by John Lombe, who, at great risk, obtained, clandestinely, a knowledge of the processes previously unknown in any other European country than Italy. The biographers of that enterprising and ingenious man, represent him as having been poisoned by an Italian, whom he had in his employ. The increase in our silk manufacture has scarcely been in a greater ratio than that of the increase of population. "Of all our great manufactures, that of iron has increased more remarkably than any other, except cotton. Iron ore was smelted in the Forest of Dean, in Gloucestershire, several centuries ago, for wood was found there in sufficient abundance to supply fuel. But the ministers of Queen Elizabeth, considering that the consumption of wood was becoming too great, restrained it by act of parliament. In 1619, a patent was taken out for using coal in the smelting process, but the wood-cutters, thinking their interest invaded, rose and destroyed the works. In the seventeenth and eighteenth centuries, the continued use of wood became a pressure on the inhabitants of the districts in the neighbourhood of the mines, and it was therefore resolved to have recourse to coal, the use of which had, by that time, grown more familiar. In 1760, our manufactures consumed almost entirely Swedish iron, and the quantity of English iron submitted to the furnaces, amounted to only 20,000 tons. In 1832 the number of tons was 700,000; and the value, seventeen millions sterling, of which four millions were sent abroad." (Ency. Metrop.) From that time to the present year, the rate of increase must have been quite unprecedented to

supply the enormous demand for home and foreign railways.

Such are the operations which give life and bustle to our thickly-peopled manufacturing districts, have caused the erection of five or six thousand factories and works, called forth the skill of mechanists and engine-makers, and which give employment to half a million persons within the factories, and two or three times as many out of them. Every part of the world exhibits some of the products of English art and industry; our manufactures precede our most enterprising travellers; and England has become the great workshop of the world. (See British Manufactures, Knight's Weekly Volume.)

SECTION III.

1. "State the circumstances which led to the introduction of the Potatoe, Tobacco, Cotton, and Tea."

The Potatoe is an indigenous production of Virginia, whence it was first introduced by Raleigh and his contemporaries, the founders of that colony. Youghall, in the county of Cork, claims the distinction of being the first place in Europe at which potatoes were grown.

Tobacco was brought into England for the first time by the disappointed colonists, whom Raleigh had endeavoured to settle in his Virginian plantations. They returned to England in 1578, and brought the knowledge of Tobacco, and the habit of smoking which they had acquired from the native savages of the place of their settlement. The use of Tobacco spread through England and Europe with astonishing rapidity; and scarcely a nation in the world is now ignorant of it.

The introduction of the Cotton manufacture is usually referred to the date 1641, but the terms in which it is then mentioned, imply that it had already reached a condition of considerable advancement. Our know-

ledge of cotton goods was acquired from our traffic with the East; and Smyrna and Cyprus first supplied our small demand for cotton and cotton yarns.

Tea has been the national beverage of China from the remotest antiquity. It was first brought to Europe by the Dutch East India Company, in the earlier part of the seventeenth century; but no public notice of its use in England occurs prior to 1660. In that year (12 C. II. ch. 23), it was enacted that "for every gallon of chocolate, sherbet, and tea, made and sold, to be paid by the maker thereof, eightpence." The tax continued to be levied upon the liquor, as sold at the coffee-houses, till after the Revolution. The first regular importation by English ships, was in 1669; but this was for the special and private use of the East India Company, as a refreshment for the committees at their meeting for business. Gradually, however, "the cup that cheers but not inebriates," extended its claims on public notice, and its supply became the most lucrative item of commerce in the long monopoly of the East India Company.

2. "Give some account of the authority exercised by the Pope, in England, before the Reformation; and of the troubles which, at different times, arose in consequence."

Before the Reformation, the Popes were acknowledged as the supreme heads in the spiritual jurisdiction of England, and exercised their authority with such tyrannous rigour, and with impositions of such heavy taxes, that it grew unsupportably grievous. They claimed the appointment, or their sanction to the appointment, of all ecclesiastical dignities, and imposed such conditions on their nominees, as placed most of the church patronage at their disposal. The sums drained annually out of the country by non-resident Italian priests frequently exceeded the revenue of the crown. But of

all the arrogant assumptions of this crushing spiritual despotism, that of excommunicating kings and princes and laying their kingdoms under interdict, was the most intolerable.

It was in opposing the usurpation of the church, that Henry II. became involved in disputes and quarrels with Becket and Pope Alexander III. In 1164, the king summoned a council, at Clarendon, where certain laws, called the Constitutions of Clarendon, were formed to check the scandalous abuses arising from ecclesiastical impunity. Becket refused obedience, alleging that acquiescence would be derogatory to the rights of the Roman Pontiffs. The ultimate result of the dispute was, the assassination of the haughty prelate—an act to which the officious zeal of some of Henry's servants prompted them, though without the king's connivance. King John became involved at the very beginning of his reign in disputes with the arrogant Innocent III. John refused to accept an archbishop, whom the Pope sought to install into the see of Canterbury, and intimated to the Pontiff that the consequence of such presumption would be fatal to the papal authority in England. No wise intimidated by the threat, Innocent laid the kingdom under an interdict,—that terrible sentence on which the prejudices of an ignorant age conferred so potent an influence. Divine service was suspended in all churches, and the rites and solemnities of sepulture refused to the dead, who were buried in the highways. But the good sense of the bishops and clergy soon rendered this sentence of very partial efficacy, and the Pope, to be further revenged on John, issued a sentence of excommunication against him in 1208, and shortly afterwards absolved his subjects from their allegiance to him, *deposed* him, and exhorted all true sons of the holy church to give effect to his ebullitions of mortified resentment. A formidable invasion by the French monarch seemed

imminent, and to avert the danger, John subscribed to a most dishonourable acknowledgment of the supremacy of the Pope; consented to pay an annual tribute of a thousand marks to the see of Rome—did homage to Pandulf the legate—resigned his crown, and received it from the legate's hands as a feudatory of the Pope; and agreed that such of his successors as refused the stipulated submission, should forfeit their right to the English crown. This disgraceful transaction alienated the affections of his subjects, and was a primary cause of their divided and wavering allegiance when prince Louis invaded the country in 1215.

At various successive periods, till the fall of papal dominations, our monarchs were involved in quarrels with the Popes; but none of these were so striking in their objects and consequences, as the two which entailed a life of disquietude on Henry II. and on John.

3. "State the difference between the habitations, fuel, food, and clothing, of the poorer classes of people in the reigns of Alfred, of Elizabeth, and of Victoria."

From the scanty notices which have been transmitted to us, on the subjects enumerated in the foregoing question, it can only be stated in relation to the time of Alfred.

1st. That the habitations of the poorer classes were of wood, wattles (i.e., stakes interlaced with osiers or other small wood) and mud; or of an admixture of these materials in proportions varying with the circumstances of the occupant. The houses had generally but one floor, covered with some material requiring little labour in its preparation; as stones, lime, and mud; and chimneys and glazed windows were unheard-of indulgences. The furniture of the houses was of the coarsest and most meagre description; few had grates, as the pictures we have of the culinary opera-

tions show. Beds were of straw and the skins of beasts.

2. Fuel; this was universally of wood, of which the great extent of uncleared forest land supplied abundance.

3. Food was the most easily raised agricultural produce, hogs' flesh, beef, mutton, beans, peas, barley, and rye-bread, pottage of the meal of these pulses, and grains, fresh and salted fish, and wild fowl.

4. Clothing was generally of coarse woollen cloth; the tunic, a sort of smock-frock, confined by a girdle, was almost the only article of dress; fur caps were in use, but long hair was frequently the only covering for the head; rough shoes, made of untanned hides, and stockings of coloured cloth, completed the simple wardrobe of most of the Saxon male population. That of the women was of equally unpretending character, but of greater length, the material being a coarse linen under-dress with a mantle above, and having the addition of a loose head-dress.

The seven centuries that intervene between the time of *Alfred* and that of *Elizabeth*, though by no means barren in traces of progressive improvement and amelioration in the circumstances of the poorer classes, present less marked changes than so long a period might have led us to look for.

1. Houses began generally to be built of brick or stone, of more capacious dimensions, and with out-buildings further removed from the dwellings. A second floor and glass windows had become pretty general, and mattresses, bolsters, flock and feather beds were in common use. These changes are spoken of in terms of regret by some writers of the period; and *Harrison*, who wrote in the latter part of *Elizabeth's* reign, remarks, that "*when houses were of wattled willow we had oaken men.*"

2. Fuel had become more scarce with the increase of population, so that turf, heath, gorse, neat's-dung, and "sea cole," were in use where wood could not be easily procured.

3. Diet. To the former list must be added, wheaten bread, butter, cheese, ale, poultry, and some of our common fruits and vegetables, as cabbage, parsnip, carrot, and towards the end of the reign—though only as an extreme rarity—the potatoe.

4. Clothing, among the poorer classes of the time of Elizabeth, was greatly assimilated, in respect to articles, to that of our own day; but gaudy colours were in general favour. The quaint dresses of our various public charities may be quoted as pretty correct models of the dress of the poorer classes of that time. Hats and hose were in general use.

In respect to our own time, while much remains to be achieved, the conveniences of social life that pertain to the inferior ranks of society, present an immense advance over those of the time of Elizabeth.

1. Habitations. It is difficult to bestow praise on a subject that has long been the theme of deprecation, but the over-crowding of dwellings, and the deficiency of drainage and ventilation of the present day must not blind our eyes to the existence of the same evils three centuries ago. The devastating diseases of former times were of the same class of remarkable maladies, and were generated by the same removable causes as those which engage the attention and talent of existing writers on sanitary matters. The evil is felt—the disposition to eradicate it exists, and is already in active operation; and so far—with allowance for the difference in the population of the present and the past—we are in advance of our ancestors. The universal adoption of stone or brick—the superior roofing—the windows—the chimneys—the greater cleanliness, and extended and

extending superiority in general style and convenience, may be cited as differences between the houses of our poorer classes and those of the reign of the virgin queen.

2. Fuel. Coal—except in remote and thinly-peopled districts—has displaced all other articles of general firing. Peat is, however, largely used in localities where it abounds.

Food and Clothing. In variety, though perhaps not in amount, the past bears no comparison with the present in its extent of conveniences under these heads. Tea, coffee, sugar, potatoe—articles now regarded as of indispensable necessity—were scarcely *known*, much less *used*, in the period with which we are contrasting this. To these might be added, most of our vegetables and fruits, and a great variety of nutritive substances of foreign growth, with all the articles in the previous enumeration that have not been displaced by superior ones. The linen, cotton, cheap cloths, woollens, and an almost endless list of smaller articles of clothing, give the present an indisputable advantage over the past in the three respects of economy, comfort, and variety.

4. “State the circumstances under which the following places were annexed to the British dominions:—Jamaica, Gibraltar, Canada.”

Jamaica was taken by Admiral Penn, father of the celebrated Quaker, in 1654. It had previously been a colony of the Spaniards, against whom the Protector Cromwell had declared war, without any reasonable ostensible pretext. Although an important acquisition, this conquest was regarded by Cromwell as an inconsiderable achievement, for the expedition of which Penn and Venables were the leaders, and they were accordingly punished by imprisonment in the tower.

Gibraltar was taken from the Spaniards in 1703, and its conquest formed the prelude to the great series of victories that signalized the reign of Queen Anne. The war during which this occurred, was entered into by William III., and continued by Anne, to curb the ambitious prospects and self-aggrandising policy of Louis XIV. of France. In addition to Gibraltar we acquired, but subsequently lost, the Spanish provinces of Catalonia, and Valencia, and the important city of Barcelona. Despite several gigantic efforts for its conquest, we have retained Gibraltar ever since.

Canada was gained from the French during the *seven years' war*, commencing in 1755. This war originated in some colonial disputes between English and French settlers in North America. At the last-named date, the French possessed Canada and Louisiana—provinces on the extreme northern and southern boundaries of the English settlements. The French endeavoured to connect these by a chain of forts and dependencies to the rear of the English colonies,—an attempt which our government regarded as an encroachment, and resented by a declaration of hostilities. In the earlier operations of the war, our arms sustained a succession of reverses. But in 1758—9, our efforts were crowned with complete success. In the latter year, Quebec was taken by the troops under General Wolfe, who fell in the moment of victory, while leading a grand charge of infantry against the French lines. In the following year the conquest of the whole of Canada was completed, and its possession was guaranteed to us at the general peace, in 1763.

SECTION IV.

1. "Illustrate the growth of the naval power of this country by reference to its most remarkable engagements at sea, and to their consequences."

Saxon chronicles afford some scanty notices of conflicts between Saxon and Danish ships till the ninth century. Alfred's hard-earned triumphs over the piratical fleets with which his coasts were often infested, taught him the necessity of extending and improving his naval force. The ships which the Normans provided for their grand achievement of 1066 were so numerous and well-appointed, that Harold's fleet declined a contest with them; and the union of both armaments gave the conqueror a decided preponderance in the command of the northern seas. King John's attention to maritime affairs, and his success in enforcing the acknowledgment of his dominion over the British seas, secured him the allegiance of his sailors at the time of the general defection of most of his other subjects. Edward I., in 1293, obtained a great victory over the fleet of his rival, the French king, and captured 250 ships. Edward III., equally successful as a naval and a military commander, encountered, captured a great part of, and totally defeated, a French fleet of 400 sail, that of Edward having numbered 250 vessels, of small size. The superiority thus acquired on the sea enabled the English king to confound his enemy by invasions at various and distant places. The first attempt at the formation of a regular royal navy was made by Henry VII., before whose time maritime expeditions were got up by the impressment, or hire, of merchant vessels. The renown acquired by English sailors, from their success and daring intrepidity in coping with that armament of unprecedented magnitude, the *Invincible Armada*, gave them a prestige of superiority which they have never since forfeited. During the succeeding century the Dutch gradually engrossed the carrying trade of Europe, and so improved their navy as to be able successfully to dispute with the English the empire of the narrow seas. But the series

of victories gained by Blake, Monk, Dean, and Penn, in the time of the Commonwealth, restored to the English an unquestioned supremacy. These commanders scoured the Mediterranean and the American shores, and inspired all nations with a respect for the prowess of English sailors. The Duke of Tuscany, and the Deys of Algiers and Tunis were compelled to reparation for losses and indignities inflicted on English merchantmen. Jamaica was captured, and Spanish commerce crippled in hostilities of the same period; and the English asserted and established claims to a participation in the lucrative trade with the East, and with South America, which before had been monopolised by the Spaniards.

A very equal naval warfare was maintained between the English and Dutch in Charles II.'s reign. Intrepidity and daring courage signalized the efforts of both nations, and many protracted actions, several of three or four days' continuance, were fought. Even our more recent periods of naval glory scarcely afford a parallel to the persevering endurance and desperate bravery with which our forces, and those of Holland, contended for the palm of naval superiority. De Ruyter, De Witt, and Van Tromp, are names of greater distinction than those of contemporaneous English admirals; but among these, Sandwich and Berkley deserve honourable mention. The valour of our sailors was exercised, and their skill improved, if no other advantage accrued, from this equal contest. In the reign of William and Anne, Russell, Rooke, Shovel, and Beabon, upheld the honour of our flag in the engagements at La Hogue, Malaga, Gibraltar, Barcelona, and others of less note. The navy was vastly increased by captures from the Spaniards and French, in the hostilities of 1739—48, and Portobello and Carthageña were taken by Admiral Vernon. Many ships of the line were captured from the French during

the seven years' war; and in the long contest between Great Britain, on the one hand, and France, Spain, Holland, and America on the other, our fleets were continually augmented by captures. The French Revolution involved all Europe in war, and, for a long period, Britain may be said to have maintained, single-handed, a contest for the supremacy of the sea against all other navies combined. Howe, Duncan, Nelson, Collingwood, and other scarcely less distinguished naval heroes, achieved victories which shed immortal lustre on their names, swept the seas of every hostile fleet, and confirmed Britain in the undisputed empire of the ocean.

In the ten years' war, ending 1803, Britain lost five ships of the line, and 46 smaller vessels, in contest with various navies: in the same period she captured, or destroyed, 74 ships of the line, 519 smaller vessels-of-war, and 807 privateers, the latter chiefly French. Of the captures, 50 sail of the line, and about 100 under that rate, were added to the British navy. Hostilities were resumed in May 1803, and extended, uninterruptedly, over another eleven years. During this war, as the most essential condition of our national existence was felt to be an overwhelming maritime force, our state of preparation was always commensurate with that conviction. Many brilliant naval actions illustrated this period of our history, and British sailors even surpassed their traditional renown. In the memorable victory off Trafalgar (Oct. 21, 1805), Nelson, the greatest naval commander of all time, terminated a career of fame by a death of glory. By the bombardment of Copenhagen, and the capture of the navy of Denmark, our fleet (1801) neutralized the alliance into which that state had been forced by Napoleon, who required its ships to repair the disastrous loss France had sustained at Trafalgar, and in other actions of less note. During this war (1803—14) we had generally

500 sail of all rates in commission, and manned by from 100,000 to 145,000 seamen and marines. Our losses in the eleven years were—ships of the line, *none*; under that rate, 90. In the same period we captured, or destroyed, 69 ships of the line, and 120 smaller vessels, of which 33 sail of the line, and 68 frigates and smaller vessels were added to our navy. Later actions—as the one at Algiers, undertaken to compel the piratical inhabitants of that state to abandon its iniquitous practices and liberate its Christian captives; that at Navarino, the object of which was to force the Turks to desist from their war of extermination against the Greeks; and minor operations of a similar character;—though they do not rank with the struggles in which we have engaged with neighbouring European nations, each effected some great object, political, commercial, or philanthropic.

2. “Under what circumstances was Scotland united to England, and what were the most important terms of the union?”

From the union of the crowns of England and Scotland, in the person of James II. till a century afterwards, the two kingdoms had preserved all the distinctiveness of separate states, with the exception of acknowledging one sovereign, and being mutually somewhat more indulgent than formerly in their commercial treaties. National prejudices and antipathies interposed an effectual barrier to the conception and realization of a unity of interest in the two portions of the same insular kingdom. But this exclusiveness of feeling was gradually displaced by more enlarged and liberal views, till, in the reign of Queen Anne, the supporters of the system of centralizing for legislative and administrative purposes became sufficiently strong to overrule their opponents. Commissioners for both countries were occupied from April till July in drawing up the articles

of an incorporating union ; and these, with some modifications, were accepted by the Scottish and English parliaments in the session of 1706—7. The first parliament for the two countries assembled on October the 23rd, 1707. The leading conditions of the act of union were—1st. That from May 1, 1707, the two kingdoms should be united under the name of Great Britain, and be represented by the same parliament. 2nd. An equality of rights, privileges, and advantages to the subjects of either kingdom. 3rd. The Scottish constituencies to be represented by forty-five members, two-thirds to be chosen by the counties, and one-third by the boroughs ; and the peers of Scotland by sixteen of their number, to be elected by their body. 4th. Each kingdom to retain its own laws and established religion.

3. “ State the difference in what were considered the necessary accomplishments of a person of fortune in the times of Alfred, Edward III., Elizabeth, and Victoria.”

In Alfred's time a person of rank met all the requirements of his station if he evinced a good knowledge of the use of arms and of warlike manœuvres.

In addition to the above, the ability of signing his name, to speak in French and English, and an aptitude in the principles of chivalry, were the appropriate qualifications of a gentleman in the time of the hero of Cressy and Poitiers.

A liberal education in the reign of Elizabeth included a thorough knowledge of the use of arms, an acquaintance with the best native literature of the time, some knowledge of the classics and of modern languages, and that enlargement of ideas which is supposed to be acquired by foreign travel.

In the present reign the use of arms has devolved on the naval and military professions only ; but a most

multitudinous range of acquirements demands the attention of persons who would be thought to have enjoyed a liberal education. Of these it may suffice to remark that a facility in composition, especially for epistolary purposes, holds a leading place in the essentials of a liberal education.

4. "Give a brief account of the leading political events, and enumerate the most distinguished statesmen of the reign of George III."

The reign of George III. is the longest in English history, and comprises a series of the most important events that have occurred in any similar period within the range of authentic records. This monarch commenced his reign on October the 25th, 1760, and married the Princess Charlotte, of Mecklenburg Strelitz, in September of the following year. His first premier was the elder Pitt, who gave place to the Earl of Bute, in 1761. In 1763 this minister incurred great odium by his termination of the war with France, one condition of his treaty being, that Great Britain should restore many of her conquests obtained from France and her allies during the protracted hostilities of the previous reign. After these restorations and exchanges of conquests for losses, Britain remained the gainer by the acquisition of Canada, part of Louisiana, Cape Breton, Senegal, the islands of Dominica, Grenada, St. Vincent, Tobago, large territories on the Coromandel Coast, Minorca, and Florida. The Bute administration was of short continuance, and was followed by that of Lord Grenville, in 1763. To the name of this statesman is attached the stigma of having lost the American colonies; as it was his Stamp Act, which formed the initiatory step in that process of alienation and hostility which resulted in the disruption of our trans-Atlantic dependencies from the mother-country. The objection

of the Americans to this act was on the constitutional ground, that taxation can only co-exist with representation; and, that since they had no voice in the legislature of the parent country, they could not justly be amenable to the obligation of contributing to its income. The resources of England having been crippled in the recent war with European powers, and the Americans having obtained the alliance of France, Spain, and Holland, the slight prospect that remained of an early termination of hostilities with the revolted provinces, left no safe alternative but a recognition of their independence. This was accordingly conceded as the leading article of a treaty of peace between Great Britain, France, and the United States, in 1783. In the following year the war with Holland was likewise concluded, on less favourable terms to the Dutch than their allies had secured. The repeal of several penal statutes against the Catholics, in 1778, elicited some extravagant exhibitions of intolerant party zeal, the great bane of social renovation. The Gordon riots of 1780 stand foremost in these lamentable fruits of bigotry and exclusiveness. To counterbalance the numerous disastrous reverses of the American war, the naval forces of England achieved a series of victories that went far to justify her proud traditional honour as mistress of the seas. Rodney vanquished the Spanish fleet off Cape St. Vincent, in 1780, and the French in the West Indies two years later. In the minor engagements in the East our maritime forces asserted their accustomed superiority. General Elliot's defence of Gibraltar against the overwhelming armaments of Spain and France, deserves to be mentioned among the later events of the war. The long trial of Warren Hastings for alleged misconduct in his command in India, and the discussion of means for obviating the threatened derangement of public business by the king's temporary aberration of

intellect occupied public attention, till the absorbing events of the French Revolution threw all other topics into the shade. While the excesses and dangerous tendencies of democratic ascendancy inspired an almost universal condemnation of the new republican government, public opinion at home was excited and drawn into more enlarged disquisition of political grievances, and associations were formed for the furtherance of reforms in the constitution. The declaration and acts of the French Convention, evincing a disposition to aid in the subversion of the neighbouring governments, and to set up republican institutions in their place, together with the judicial murder of Louis XVI. in 1793, impelled the the British government to declare war against the French and their allies. In the earlier operations of the war Britain sustained some humbling checks by land, but more than vindicated her naval superiority. Lord Howe defeated a French fleet off Ushant, in 1794; Sir John Jervis vanquished a Spanish squadron off Cape St. Vincent, and Lord Duncan beat and captured the Dutch fleet off Camperdown, in 1797. To crown this series of triumphs, after having swept the sea of hostile squadrons, Nelson almost annihilated the French navy, at the memorable battle of the Nile, in 1798. In the same year an extensive rebellion broke out in Ireland, which was not repressed without much bloodshed. The disorders and defective administration of that country were in a great measure removed by the legislative union, which dates from January 1, 1800. The great military successes of Buonaparte terrified several European powers into a withdrawal from the confederacy into which they had entered with Britain, which, after ten years' war almost single-handed against most of the powers of Europe, was glad of the resting-time afforded by the peace of Amiens, in 1802. It soon became apparent that Napoleon, now become Emperor

of France, had no serious design of observing the stipulations of the recent treaty, and, accordingly, war was vigorously recommenced in 1803. The political history of Britain, till the final overthrow of Buonaparte, and the emancipation of the many prostrate nations that had succumbed to his military genius, is chiefly that of a warfare which exhausted our resources and engaged all the energies of Europe to an unprecedented extent. Most of the powers of Europe, in the early part of the contest, were arrayed against England; but she rose superior to all disadvantages, was the only curb to the criminal ambition of that modern Alexander, whose thirst for conquest and dominion appeared insatiable, and whose fiat was at one time law from the Atlantic to the plains of Russia, from the shores of the Mediterranean to the Arctic Ocean. But Napoleon, though with a martial and enthusiastic nation completely subservient to his will, was thwarted on all sides by the operations of the English; and their successes encouraged Spain, Portugal, Italy, and the northern powers, to throw off the yoke of a worse despotism than had been known under the worst times of native misrule. The best blood and treasure of Britain were lavished with no niggard hand in the cause of European freedom, and her own shores were always secure from hostile aggression. The decisive victory of Trafalgar, which cost the life of the great Nelson, crushed every hope of rivalry on the watery element, and left Britain the undisputed empire of the sea. Similar naval victories of scarcely less moment signalized this war; and on land the Duke of Wellington, and his brave coadjutors of various nations, tested the supposed invincibility of Buonaparte. In the Peninsular our military proved themselves equal to the best armies of Europe; and the proud victors of Austerlitz, Jena, Lodi, Friedland, and Wagram, were vanquished by our troops at Vimiera,

Corunna, Talavera, Busaco, Barossa Albuera, Ciudad Rodrigo, Badajoz, Salamanca, Vittoria, and St. Sebastian. So well timed and simultaneous were the operations and successes of the allies, that just as the British had cleared Spain of her invaders, and had followed them across their frontier, the Russians, Austrians, and Prussians had brought their long-dreaded enemies to a stand in Paris itself. Napoleon was compelled to abdicate, France stripped of all her conquests made since the establishment of the republic, and the legitimate sovereign welcomed to the throne of his ancestors (28th of April, 1814). But the peace of Europe was of short duration. Napoleon escaped from Elba, the place of his seclusion, in February 1815, and delusive visions of glory and aggrandisement impelled the French to an instant and uncompromising transfer of their allegiance to their idolized general and emperor. Europe was again convulsed, but only for a brief space, and Napoleon's hopes were for ever crushed, by his defeat at the great *Battle of Waterloo*, on June 18, 1815. This last of the great engagements in modern European warfare was gained by the British troops, partially assisted by the Prussians, under the command of the Duke of Wellington. Napoleon, seeing no hope of escape, as Paris was immediately occupied by the allies, surrendered to the captain of the *Bellerophon*, a British man-of-war, was brought to Plymouth, and thence consigned to perpetual banishment in St. Helena, where he died in 1821.

During the last ten years of George's reign, owing to the re-appearance of his mental malady, the royal functions were discharged by his son, under the title of Prince Regent. This period was characterised by much popular excitement on political grievances; the advocacy of parliamentary reform, and the arbitrary efforts of the Castlereagh administration, to repress the

slightest indication of popular discontent. The people were almost goaded into rebellion ; riots occurred in some places ; and one meeting in Manchester (in August, 1819), of an orderly and peaceable character, convened to petition parliament in a constitutional manner, was dispersed by cavalry with considerable bloodshed. The matters for which these petitioners agitated have been long since conceded, and the inexpediency and uselessness of arbitrary measures recognised. George III. died in January, 1820, after a reign of nearly 60 years.

Among the leading statesmen of this reign, were— Lord Chatham, Lord North, Lord Thurlow, Lord Mansfield, Pitt, Fox, Burke, Dundas, Percival, Grenville, Canning, Eldon, Castlereagh, Liverpool, Holland, &c.

ANCIENT AND MODERN HISTORY.

SECTION I.

1. By what nations were the Israelites surrounded, and to which were they at different times, or in different portions, given into captivity?
2. Describe the extent of Alexander's dominion at his death, and name his successors.
3. Name the greatest poets, philosophers, and historians of Greece.

SECTION II.

1. Under what Roman emperors were the Christians most cruelly persecuted?
2. What were the successive forms of government in Rome?
3. Name the principal provinces of the Roman empire at its great extent, and the countries of modern times which are included in each.

SECTION III.

1. When did the division between the Eastern and Western Empire take place; and what was the line of separation between them?
2. Which of the northern nations possessed themselves of the greater portions of Britain and Gaul on the decline of the Western Empire?

3. When was Constantinople taken, and what effect had its capture upon the literature of Western Europe?

SECTION IV.

1. In what countries did the Reformation become firmly established; and what is meant by the Edict of Nantes, and its Revocation?
 2. What countries have been colonized from Europe, and by what nations?
 3. What gave occasion to the American War of Independence, and to the French Revolution of 1789?
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SECTION I.

1. "By what nations were the Israelites surrounded, and to which were they at different times, or in different portions, given into captivity?"

To the north-west of Palestine were the Phoenicians, among whom the inhabitants of Tyre and Sidon are frequently mentioned in Scripture. To the north-east of Palestine were the Syrians; to the east, the tribes of the Amalakites and Midianites; and to the south, the Ammonites and Philistines. More anciently, the people in contact with the Israelites on their northern frontier were the "Canaanites, and Sidonians, and the Hivites that dwelt in Mount Lebanon" (Judges iii. 3).

The Israelites were successively vanquished, wholly or in part, by:—1st. The king of Mesopotamia, who was taken captive by Othniel, the successor of Joshua in the leadership of the Israelites. 2nd. By Eglon, king of Moab, whose dominion Ehud terminated. 3rd. By the Philistines, against whom Shamgar distinguished

himself. 4th. By Jabin, king of Canaan, from whom the Israelites were delivered, under the leadership of Deborah and Barak. 5th. The Midianites and Amalekites, whose oppression was terminated by the several decisive victories of Gideon. 6th. The Ammonites, who were at length overthrown by Jephthah. 7th. The Philistines, against whom Samson signalized himself, though it remained for Saul and David effectually to subvert their dominion. 8th. Great encroachments on the territory of the Israelites were made in the time of their kings till the ten tribes were carried away captive by Shalmanezzer, king of Assyria, 721 B.C. 9th. The remaining two tribes shared the fate of their brethren when, under their last king Zedekiah, they were carried captive to Babylon. 10th. On the return of the two tribes from captivity they remained tributary to the Persians, secured the protection of Alexander the Great, in 332 B.C., but were subjected to the Egyptians, under Ptolemy, 320. 11th. Antiochus, king of Syria, persuaded the Jews to transfer their allegiance from the Egyptians to him, 294 B.C. 12th. On account of the tyranny and cruelty of the Syrians, the Jews made a successful effort to regain their independence, which they finally lost, by the reduction of their country to the condition of a Roman province, 63 B.C.

2. "Describe the extent of Alexander's dominions, at his death, and name his successors."

At the time of his death the countries which acknowledged the sovereignty of Alexander, exclusive of those which were tributary to him in various degrees, were Macedon, all the Grecian States, the whole of Asia Minor, Egypt, Arabia, Phœnicia, and Persia: the Ganges was at one time the eastern, and the Adriatic the western, boundary of his empire.

After many intrigues and dissensions among his officers, his empire was dismembered into four great monarchies, of which Ptolemy obtained Egypt, Libya, Arabia, Cœle Syria, and Palestine; Cassander had Macedon and Greece; Lysimachus had Thrace, Bithynia, and other provinces, near the Bosphorus and the Hellespont; and Seleucus the remainder, except some remote provinces, which had again asserted their independence, as the doubtful conquests on the Indus and Ganges.

3. "Name the greatest poets, philosophers, and historians of Greece."

1. Poets—Linus, Orpheus (both doubtful as to the authenticity of remains imputed to them), Homer, Hesiod, Terpander, Sappho, Alcæus, Simonides, Pindar, Anacreon, Eschylus, Euripides, Sophocles, Aristophanes, Menander, &c.

2. Philosophers—Thales, Anaxagoras, Pythagoras, Zenophanes, Zeno, Parmenides, Democritus, Anaxarchus, Socrates, Plato, Aristotle, Diogenes, Epicurus, &c.

3. Historians—Herodotus, Thucydides, Xenophon, Polybius, Diodorus Siculus, Dionysius of Halicarnassus, Strabo, Plutarch, Arrian, &c.

SECTION II.

1. "Under what Roman emperors were the Christians most cruelly persecuted?"

Under Nero, Domitian, Maximin, Decius, and Diocletian; and to a less extent under Trajan, Adrian, Antonius Pius, Severus, Gallus, and Valerian.

2. "What were the successive forms of government in Rome?"

The first form of government among the Romans

was that of kings, of whom, according to the doubtful records that remain of that remote period, there were seven, in two hundred and forty-four years. The regal government began with Romulus, 752 B.C. His successors were, Numa Pompilius, 715 B.C. ; Tullus Hostilius, 672 ; Ancus Martius, 640 ; Tarquinius Priscus, 616 ; Servius Tullius, 578 ; Tarquinius Superbus, 534 to 509. The tyranny and vices of Tarquin the Proud procured his expulsion, and the abolition of kingly government.

The next form of government was monarchical in all but the name of the chief magistrates and the limited duration of their power. This was that of the consuls, of whom there were two contemporaneously, and their jurisdiction lasted for a year. The supreme government was vested in an annual succession of consuls, from 509 to 451 B.C. The consulate was displaced by the Decemvirate, or government of ten, which lasted only three years, when the consuls and the *tribunes*, or representatives of the people, were restored to their functions, and the popular element became the leading feature in the constitution. Many partial revolutions interrupted the period of the consulate; till its extinction by Julius Cæsar, 45 B.C. That successful general caused himself to be created consul for ten years, then perpetual dictator and imperator. But if the republic and popular liberties were extinguished, the name of a king was so odious to a large section of the Roman citizens, that on Cæsar's attempting the formal assumption of that title he was assassinated (44), and the Triumvirate established, 43 B.C. In 59, Pompey, Crassus, and Cæsar had divided among them the supreme power, which afterwards devolved on Cæsar alone. The reign of Cæsar may therefore be said to have intervened between the first Triumvirate and the second, which was established on the death of Cæsar,

by Antony, Lepidus, and Octavius. The deposition of Lepidus, and the death of Antony, left Octavius the sole master of the Roman empire (B.C. 27). He assumed the name of Augustus, and the style of emperor; and thenceforth almost every trace of the old republican institutions was extinguished. Soon the vigorous government of the emperors degenerated into a crushing military despotism, for the legions, at first the support of arbitrary power, became the masters of the emperors.

3. "Name the principal provinces of the Roman empire at its greatest extent, and the countries of modern times which are included in each."

Ancient name.

Modern name.

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|---|--|
| 1. Italia | Italy. |
| 1. Gallia | France. |
| 3. Hispania vel Iberia .. | Spain. |
| 4. Lusitania | Portugal. |
| 5. Britannia | England & part of Scotland. |
| 6. Dacia | Hungary & Transylvania. |
| 7. Dalmatia | { The northern and greater
part of Turkey. |
| 8. Mysia | |
| 9. Pannonia-Illyricum .. | Sclavonia and Croatia. |
| 15. Græcia | Greece & southern Turkey. |
| 11. Rhætia | { Austria. |
| 12. Noricum | |
| 13. Asia Minor, &c..... | Turkey in Asia. |
| 14. Syria and Judæa ... | Syria and Palestine. |
| 15. Africa Propria, Mauritania, & Numidia } | { Morocco, Algiers & Tunis,
or the States of Barbary. |
| 16. Egyptus ..... |  | Egypt. |

The foregoing is a list of the principal Roman provinces before their partition into the Eastern and Western Empires.

SECTION III.

1. "When did the division between the Eastern and Western Empire take place; and what was the line of separation between them?"

Constantine the Great first divided the sovereignty of the Roman empire, A.D. 337; but his grandson, Julian, reunited the separate governments in 362. Valentinian began his reign (364) by associating with himself in the government of the empire his brother Valens, to whom he gave the government of the East. In 392 the empires were again amalgamated under Theodosius the Great, who bequeathed to his sons, Arcadius and Honorius, the separate sovereignties of the East and the West, in 395, after which they were never again united.

The extent of these empires fluctuated from time to time; but the original provinces of each were—1st. For the Western—Italy, Illyria, Africa, Spain, Britain, and Gaul. 2nd. For the Eastern—Thrace, Macedonia, Dacia, Asia Minor, Pontus, Armenia, Assyria, Media, and Egypt.

2. "Which of the northern nations possessed themselves of the greater portions of Britain and Gaul on the decline of the Western Empire?"

Britain became the prize of the Saxons and Angles, two Germanic tribes, who formed the Saxon Heptarchy in the fifth and sixth centuries.

The Visigoths compelled Honorius to cede them the southern province of Gaul, but were expelled by the Franks, a confederacy of German tribes, who inhabited the country lying along the lower Rhine and the Weser. Clovis, king of the Franks, after many collisions with the Visigoths and Burgundians, in his frontiers, finally consolidated his kingdom, and made Paris his capital, A.D. 510.

3. "When was Constantinople taken, and what effect had its capture upon the literature of Western Europe?"

Constantinople had been frequently threatened, and its adjacent territory gradually encroached upon by the Turks, who, under their Sultan Mahomet II., at length captured the metropolis of the Eastern Empire, A.D. 1453. On the fall of their capital, and the subversion of their empire, many learned Greeks sought refuge in the countries of Western Europe, and carried with them a knowledge of philosophy and literature.

SECTION IV.

1. "In what countries did the Reformation become firmly established; and what is meant by the Edict of Nantes, and its revocation?"

The Reformation obtained a permanent footing in England, Scotland, Sweden, Norway, Denmark, Northern and part of Central Germany, Holland, Switzerland, and, to a partial extent, in Ireland and France.

The Edict of Nantes was an enactment extorted by the French Protestants from their opposition king, Henry IV. By it the Protestants had guaranteed to them the possession of all the churches then (1598) in their hands, and equality with Catholics in civil and religious privileges. The revocation of the Edict of Nantes was a repeal of that act of toleration, and the substitution of a rigorous system of persecution against the Protestants. Their worship was denounced, their churches demolished, their ministers banished, and the laity forbidden, under great penalties, to quit the kingdom. Vast numbers contrived to escape, of whom many settled in England, and many were assassinated, or compelled to abjure their faith.

2. "What countries have been colonized from Europe, and by what nations?"

The United States, British America, and Newfoundland, are chiefly occupied by people of English descent. The exceptions are, that Canada, Louisiana, New Orleans, and a few other districts and towns, received their first inhabitants from France; and small colonies of Germans and others have settled in some districts. The French have left traces in respect to language and institutions likely to be permanent, but the English is the predominant language.

The English, and their fellow-subjects of the United Kingdom, have likewise colonized New Zealand, many parts of Australia, and Cape Colony (originally a Dutch settlement, but many English have gone thither since its conquest by us in the last war).

The Portuguese colonized Brazil, the Madeiras, the Canaries, the Azores, and the Cape Verde Islands. The Spaniards have perpetuated their race and language in Mexico, Central America, Venezuela, New Granada, Ecuador, Peru, Bolivia, Chili, and La Plata.

The French have colonized Algeria, Bourbon, and some provinces and islands that have been wrested from them in time of war.

The *foreign possessions* of some European nations are of vast extent, sometimes greatly exceeding their home territory and *colonies*.

The Dutch have Java, Sumatra, part of Borneo, many smaller islands, and Surinam, on the north coast of South America.

The Spaniards have the Philippine Islands, Cuba, &c.

Our Indian Empire is ten times greater than all the British Islands.

3. "What gave occasion to the American war of independence, and to the French Revolution of 1789?"

For the American War, see History of England, Section iv.

The French Revolution of 1789 is referable to the concurrent operation of many causes. Of these the primary one was the disgust and exasperation of the people at the burdensome exactions of a vicious government, at the vehement opposition of the privileged classes to any retrenchment in their exclusive privileges and exemptions, and at the misappropriation of public money. The aid rendered by the French to our revolted American colonists aroused public attention in France to questions of constitutional right and political freedom, whereby notions were engendered of a character greatly at variance with the existing state of things. Famine prompted to sedition, and goaded to desperation, each concession of government to the reasonable demands of the people became the prelude to greater and greater encroachments on the prerogatives of royalty and the distinctions of classes. Soon the excesses of a wild democracy gave a lesson to the world of the danger of sudden political enfranchisement to a nation with whom the idea of a rational freedom has not been made familiar by a participation in its blessings. The tardy growth of wisdom in nations and governments is illustrated by the recurrency, in February, 1848, of a similar French Revolution, and consequent to like cause, to that which convulsed the world in 1789. That it will not be accompanied by such wide-spread evils and disastrous consequences is at present a fair theme for gratulation to individuals and to nations.

CHURCH HISTORY AND LITURGY, &c.

SECTION I.

1. When did Gregory the Great live; and in what respect is England specially indebted to him?
2. Give a brief account of those councils which are recognized as authorities by the Church of England.
3. State the time and the causes of the schism between the Eastern and Western Churches.

SECTION II.

1. Who established the tax of Peter's pence, and what was the nature of that tax?
2. Mention some occasion when England was laid under interdict by the Pope, and state the effects of that measure upon society.
3. How long did the Popish party remain in communion with the Church of England in the reign of Elizabeth, and under what circumstances did they separate themselves?
4. State briefly the origin of the Reformation in England, and its progress up to the death of Edward VI.

SECTION III.

1. What do the articles affirm concerning the sufficiency of the Holy Scripture?

2. What errors are guarded against in the definition of the two Sacraments?
3. What authority is there from Scripture and antiquity for the use of a language "understanded of the people," in the services of the church?
4. How many of the articles refer to the doctrine of the Holy Trinity? Quote one of these, giving proofs from Holy Scripture.

SECTION IV.

1. State by what progressive steps the Holy Scriptures were rendered accessible to the people in the reigns of Henry VIII. and Edward VI.
2. When, and by whom, was our present authorised version of the Holy Scriptures made?
3. Give a short account of the origin of the Book of Common Prayer, and the principal changes which it has undergone.

SECTION I.

1. "When did Gregory the Great live; and in what respect is England especially indebted to him?"

This best of the bishops of Rome was born A.D. 550, was consecrated Pope, 590; and died, 604. To him we owe the second introduction of Christianity into England. Previously to his elevation to the pontificate he had seen some Anglo-Saxons exposed for sale in the slave market, at Rome; and the particulars he learned of them and their country impressed him with the charitable design of establishing a Christian mission in our island. When he had been pope some years, he

sent Augustine, with a company of monks, on this holy work, about the year 596. The efforts of these Christian teachers were crowned with signal success, and the grateful piety of our ancestors long celebrated the memory of Gregory the Great.

2. "Give a brief account of those councils which are recognized as authorities by the Church of England."

The councils whose canons and decisions are accepted and acknowledged by our Church to be conformable to Scripture and Apostolic usage, are the Six Ecumenical Councils.

The first of these was the First Council of Nice, convened, A.D. 325, by the Emperor Constantine, to decide on the great heresy of Arius, who denied that Christ was truly God, and made many subtle and erroneous distinctions in vital doctrines. The council was attended by 318 bishops, who condemned the dangerous heresy of Arius, and gave an emphatic expression of the belief of the universal church in the words of our present Nicene Creed.

The second was assembled by the Emperor Theodosius, in the year 381, at Constantinople. The object for which it was convened, was to determine some disputed points respecting the Trinity, and especially to combat the heretical views of Macedonius about the Holy Ghost. This council added to the Nicene Creed the words which declare the divinity of the third person of the Trinity.

The Council of Ephesus (431) was the third. It confuted the heresy of Nestorius, who taught that the Word or divinity had not become man, but had united with the man Jesus; and that it was the human nature of Christ alone that had died for the sins of the world. This was in opposition to the declarations of Holy

Writ, "The Word was made flesh and dwelt among us," and that God "Purchased the church with his own blood." The heresy of Pelagius, who denied the transmission of sin from Adam to his posterity, and the regenerating influence of Baptism, was likewise condemned in this Council.

The Council of Chalcedon (451) was the fourth. It decided against the error of Eutyches, who taught that in Christ was a single nature only, compounded of the divine and human, but neither God nor man. It asserted that in Jesus Christ there are two perfect and distinct natures, the godhead and manhood, united in one person, without mixture, change, or confusion. Most of the Christians of Asia, even at the present day, hold the heresies of Nestorius and Eutyches in varying forms of admixture.

The fifth was summoned by the Emperor Justinian, and met at Constantinople, 553. It condemned various writings of a dangerous tendency, including the Three Chapters, i.e., the writings of Theodore, of Theodoret, and of Ibas, which favoured the Nestorian doctrine. Origen and his followers were likewise condemned in this council.

The sixth and last of the synods, recognized as œcumenical by our church, was held at Constantinople, in 680. During the half century preceding that date, a heresy, similar to that of the Eutychians, had sprung up and found many advocates in the East. Honorius, bishop of Rome, likewise favoured it. The distinctive appellation of this controversy is the Monothelite heresy—that is, the belief in *one will*, the denial of two wills, the one pertaining to the divine, and the other to the human nature of our Lord. The church of Rome acknowledges nineteen œcumenical councils, but none after the sixth, can justly be called universal. The last that was held was the Council of Trent, convened

by the Romanists to crush the Reformation. It sat from 1545 till 1563.

3. "State the time and the causes of the schism between the Eastern and Western Churches."

Many causes of estrangement between the popes and the patriarchs of Constantinople, had arisen at various times between the years 680 and 1054. In 1053, Michael Cerularius, the patriarch of Constantinople, wrote to the bishop of Pruni, in Italy, a long list of charges against the religious doctrine and practice of the Latins. Leo XI., the pope at the time, expressed his indignation by his issuing a solemn excommunication against the Greek churches. Monomachus, the Greek emperor, correctly anticipating the bitter fruits of such a final alienation between the East and the West, exerted all his policy to heal the breach. He sent to the pope requesting that legates might confer with the patriarch in Constantinople, and concert measures for healing the breach in the tranquility of the church. But these wise efforts were thwarted by the mutual arrogance and ambition, and by the reciprocal animosities of the pope and patriarch. Not being able to assert the supremacy of their master, nor a recantation of the patriarch's objections to their doctrine and discipline, the legates left an excommunication of the Greek church on the altar of the patriarchal church at Constantinople. The patriarch responded with equally vehement imprecations and anathemas against the pope and his adherents; and the schism was thus completed in 1054. The charges which Cerularius brought against the Western Churches were trivial in the extreme, but they were not met in the spirit of Christianity or of a generous zeal for the cause of truth.

Among them were; that the Latin churches used unleavened bread in the celebration of the Lord's Sup-

per; 2. that the monks eat lard, and were permitted the use of flesh to sick and infirm brethren; 3. that the bishops adorned their fingers with rings; 4. that their priests were beardless; 5. that they confined baptism to a single immersion. Such were the trifles that were permitted to bring upon the church one of the most disastrous events with which she has ever been visited.

SECTION II.

1. "Who established the tax of Peter's pence, and what was the nature of that tax?"

Ina, king of the West Saxons, at the suggestion of Gregory II., first granted the household tax, called Peter's pence, in 725. It was at first a penny on each house, and was collected on the feast of St. Peter, in Vinculis; its original object having been the establishment and support of an English College, at Rome. In 794, Offa extended it over East Anglia and Mercia; Egbert did so for all England; and successive sovereigns, till Henry VIII., and increased the tax though the popes had long appropriated it to other purposes than that for which it had originally been levied.

2. "Mention some occasion when England was laid under interdict by the pope, and state the effects of that measure upon society."

See reply to question 2. Sec. III. His. England.

3. "How long did the Popish party remain in communion with the Church of England in the reign of Elizabeth, and under what circumstances did they separate themselves from it?"

The Popish party continued in communion with the Anglican church till 1570, when they began to separate and form a distinct sect. They did this in consequence

of the sentence of excommunication pronounced against Elizabeth and her supporters, by Pius V. in 1569.

4. "State briefly the origin of the Reformation in England and its progress up to the reign of Edward VI."

The preaching of Wickliffe against the prevailing errors of the Roman church, and his translation of the Scriptures into English were the initiatory steps, or, at least, the germs of the English Reformation. But the proximate causes of the final and decisive repudiation of Papal corruptions and usurpation appear in the reign of Henry VIII. The refusal of compliance on the part of the Pope to that king's desire for a dissolution of his marriage with Catherine, produced a breach in the friendly relations of the English and Papal courts. The first result of this breach was, the suppression, by the king and parliament, of all the usurped privileges that the popes had heretofore enjoyed in England. In 1532—3 all the pecuniary claims of the court of Rome were declared illegal, and were forthwith abolished. Every branch of the Papal jurisdiction was at the same time suppressed; and 1534 provincial synods, at Canterbury and York, gave unanimous verdicts to the proposition for no longer recognizing the authority of the bishops of Rome in England. But these reformations, though great steps in the right direction, concerned discipline and church government only. The more important restitution of purity of doctrine was of more gradual growth. In 1537, and 1543, the king and convocation issued two manuals of doctrine, called respectively, "The Institution of a Christian Man," and "The Necessary Doctrine and Erudition for any Christian Man;" in which many abuses were disclaimed. All monastic establishments were suppressed, and the revenues confiscated in 1540. From these vast funds, six

new bishoprics were endowed, but the greater portion of the enormous wealth was misappropriated. When Edward came to the throne in 1547, the reformers found full scope for the complete development of their views; and the church soon assumed a condition in respect to faith and practice from which the present differs but slightly. Images and relics were removed from churches; the communion in both kinds given to laity; and the liturgy in English compiled.

SECTION III.

1. "What do the articles affirm concerning the sufficiency of the Holy Scripture?"

That they contain all things accessory to salvation. See Art. 6.

2. "What errors are guarded against in the definition of the two sacraments?"

We reply to this question by a few extracts from Burnet, on the Articles.

"The virtue of the sacrament being great in the worthy receiving excludes the doctrine of *opus operatum* (the very working of them) as effectually as if it had been expressly condemned; and the naming the two sacraments instituted by Christ, is upon the matter, the rejecting of all the rest. * * * All sacramental actions are acceptable to God only with regard to the temper and the inward acts of the person to whom they are applied. * * * The other extreme that we likewise avoid is that of sinking the sacraments so low as to be mere rites and ceremonies. * * * They are not bare and naked remembrances and tokens, but are actuated and animated by a divine blessing that attends them."

3. "What authority is there from Scripture and antiquity for the use of a language 'understood of the people,' in the services of the church?"

St. Paul, in his First Epistle to the Corinthians, 14th chapter, 19th verse—and indeed through a greater part of the chapter—argues, expressly, against the use of an unknown tongue in the services of religious assemblies. Justin Martyr's APOLOGY, and many other writings of antiquity, imply, in a manner not to be misunderstood, the use of the language of the people, in the services of the church. An unwarrantable reverence for antiquity led Boniface, in the eighth century, to insist on the use of the Latin liturgy in the churches which he founded among heathen nations. Before the subversion of the Roman empire and its occupation by the northern invaders, Latin was, to a great extent, the common language of southern and western Europe. Some plea existed for endeavouring to preserve uniformity when most Europeans were, in one sense *Romans*; but this was no longer in force when new nations and new languages took the place of old Roman provinces. See Burnet, on Article xxiv.

4. "How many of the articles refer to the doctrine of the Holy Trinity? Quote one of these, giving proofs from Holy Scripture."

The first article distinctly enumerates the doctrines of the Trinity; the three following ones refer expressly to our Saviour, the second person of the Trinity; and the fifth declares the belief of the church in the divinity of the Holy Ghost, the third person in the blessed Trinity in Unity.

For Scripture authority for the first article, see 1 John, v. 7; Matt. iii. 16, 17; 2 Cor. xiii. 14; Matt. xxviii. 19. These are the chief texts in which the Trinity is mentioned altogether.

SECTION IV.

1. "State by what progressive steps the Holy Scriptures were rendered accessible to the people in the reigns of Henry VIII. and Edward VI.

In 1535 a Convocation determined on the preparation of an authorized version of the English Bible, to supply, in some degree, the great desire in the popular mind for the word of God. In the same year Miles Coverdale completed his translation, and obtained permission to dedicate it to the king. About the same time Lord Cromwell, vicar-general to the king, obtained a royal injunction commanding every incumbent of a parish church to provide a copy "of the Bible, both in Latin and in English, and to lay it on the choir for every man that would, to look and read therein." In 1537, the royal licence was given to the translation, which had been appointed and prepared under the auspices of the Convocation. The remainder of this question, and also the next, is answered in Appendix ii.

2. "When, and by whom, was our present authorized version of the Scriptures made?"

See Appendix i. Question 3.

3. "Give a short account of the origin of the book of Common Prayer, and the principal changes which it has undergone."

Before the reign of Edward VI., the only advance towards the use of English in the public services of the church, was "the form of praying in their own tongue" provided in Henry VIII.'s PRINCE. It contained the Creed, the Lord's Prayer, the Ten Commandments, a Litany, almost the same as at present, together with prayers, hymns, and select passages of Scripture, for morning and evening service. This manual was published in 1545. Up to that date, the Roman

Breviary, Missal, and Ritual, similar to those now used in Roman Catholic services, were the formularies of our English Church. In 1547, a Commission met at Windsor, and drew up a Book of Common Prayer, in English, which was approved by the Convocation of Canterbury and York, and ratified by act of parliament, in January, 1549. This Liturgy, substantially the same with that now in use, is, for the most part, simply a translation of ancient formularies, with the omission of all doctrinal or superstitious errors, the growth of later and corrupt ages. In 1650—1, owing to the remonstrances of the more enlightened reformers against the retention of some passages savouring of the old Romish superstitions—passages which had not been expunged from a respect to popular prejudice—a Commission was appointed to revise the Book of Common Prayer. Martin Bucer, and Peter Martyr, two distinguished German reformers, whom Cranmer had invited to England and appointed to the office of Regius Professor of Theology, in the Universities of Oxford and Cambridge respectively, exerted a leading influence in this revision. This edition was distinguished from the former by the following additions: the sentences, exhortation, confession, and absolution, at the commencement of morning and evening service, some of the occasional prayers, forms for the consecration and ordination of bishops, priests, and deacons; and a rubric, at the end of the Communion Service, explaining the reason of kneeling. From it were expunged some rites and ceremonies, as the use of oil in baptism, unction for the sick, and prayers for the dead.

On the accession of Mary, 1553, an act was passed prohibiting the use of King Edward's Liturgy, and ordering a return to that of Henry VIII. This act of repeal was reversed as soon as Elizabeth came to the throne, and a Commission, with Parker, afterwards

archbishop of Canterbury, at its head, appointed to make another revision of the liturgies of King Edward. This Commission adopted as its groundwork the second book of Edward VI., with which it incorporated the lessons for every Sunday in the year. Some slight alterations were made in the Litany; and the sentences addressed to communicants were added, with the prayers for the queen, the prayer for the clergy, and some minor modifications. No further alterations were made till the first year of James I., when the form of thanksgiving at the end of the Litany, and the part of the Catechism relating to the Sacraments, were added. In this state the Liturgy continued to the Restoration, when an attempt was made by the Savoy Conference to remove the scruples of the Presbyterians. But their demands were found to be so unreasonable that none of their propositions were adopted. The episcopal divines, however, changed some of the lessons in the Calender for others more appropriate to the days, added the prayers for parliament and *for all conditions of men*, altered several of the collects, and added the office *for the baptism of such as are of riper years*, and *the form of prayer to be used at sea*. This final revision was completed in 1661.

SCRIPTURE HISTORY.

SECTION I.

1. Write a short history of Moses.
2. State the circumstances which led to the separation of the kingdoms of Judah and Israel, and the chief events of their subsequent history.
3. Describe the tabernacle of Moses, and the sacred things which it contained.
4. By whom were Damascus, Nineveh, and Babylon taken, and by which of the prophets was the destruction of each foretold?

SECTION II.

1. Give a short account of the several appearances on earth of our Lord Jesus Christ after his resurrection.
2. What were the chief subjects of our Lord's predictions? Quote, as nearly as you can, the words of one of them.
3. Name the different members of the family of Herod, mentioned in Holy Scripture.
4. Explain the parable of the labourers in the vineyard.

SECTION III.

1. Draw a map of Jerusalem and its vicinity, illustrative of the gospel history.

2. Mention, in the order of time, the chief epochs of Scripture History, and give their dates.
3. Describe, accurately, the ceremonies of the great day of atonement.
4. To what kind of government were the Israelites successively subject?

SECTION IV.

1. What offices are intimated under the name of "Christ," and how have those offices been fulfilled?
 2. What is a type, and what an antitype? Illustrate your meaning by a reference to the passage of the Israelites through the Red Sea—the brazen serpent—and the prophet Jonah.
 3. In what passage of the New Testament are the following duties most strongly inculcated:—self-denial, consistency, discretion, courteousness, loyalty, and diligence in temporal employments.
 4. Show from the Holy Scriptures that the Holy Spirit is a person, and ought to be worshipped.
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SECTION I.

1. "Write a short history of Moses."

The workings of Providence towards his peculiar people, after they had long resided in bondage, required that they should now be led towards the land which had been promised to their progenitor as the possession of his descendants. But the condition to which they had so long been degraded also required that their leader should be a man of no ordinary talents, of no

common capabilities ; yet that he should be one of that despised people. At the worst crisis of the oppression of their race, Amram and Jochebed were gladdened with the birth of a son, the circumstances of whose early life excited hopes in his parents that he was destined to higher aims and purposes than those to which any of his oppressed brethren could aspire. Previously to his birth (1571 B.C.) an edict had gone forth from the Egyptian Palace requiring that every male child born to the Israelites should be destroyed. To evade the edict (Exod. i. 22) his mother, Jochebed, concealed the child three months ; but finding it impossible longer to secrete her son, she determined to entrust him to the disposal of that God of whom their slavery in Egypt had all but erased the knowledge. She determined upon making an ark of bulrushes, placing the goodly child therein, and committing it to the banks of that river which already should have received his body. At the same time the sister of the child was commanded to watch the ark at a distance. Pharaoh's daughter was seen to pass near the ark ; her curiosity was awakened, she ordered her maids to lift the bullrush covering, and there beheld Israel's future leader. The child called forth her sympathy, and she determined to save his life, and adopt him as her son. The name that was found for him was expressive of the condition from which he had sprung. "Mo," water—"Oudsche," saved, which, combined, afforded the appropriate appellative, Moses.

Jochebed, for her dependence upon Providence, was rewarded by the return of her child till he was of sufficient age to be admitted into the palace of Pharaoh. During this time, doubtless, his real parentage, the incidents of his birth, and his providential deliverance, formed grateful subjects for his mother to instil into the mind of her child. At length arrived the period

at which he was to be advanced to the noble position of an Egyptian Prince (Exod. ii. 1—10). His education was commensurate with the position to which he had been raised; he was "learned in all the wisdom of the Egyptians, and was mighty in words and in deeds" (Acts. vii. 22).

A gap in the history of the future leader of Israel's host, as related in the Pentateuch, is filled up by Josephus, Philo, and others, with legends highly improbable, and to which little credit can be attached.

At the age of forty he conceived the idea of freeing his enslaved brethren from the Egyptian yoke; "choosing rather to suffer affliction with the people of God than to enjoy the pleasure of sin for a season" (Heb. xi. 25). From this passage in his history (Exod. ii. 11), it appears that he deplored the wrongs of his countrymen, and was deeply moved by their afflictions. Actuated by these feelings, on one occasion, he beheld an Egyptian (probably an officer) ill-treating a Hebrew, and in a moment of intense resentment inflicted death upon the oppressor. The next morning afforded him an opportunity of witnessing a strife between two Hebrew brethren. He proffered a friendly remonstrance, but his offices as a peace-maker were met by a rejoinder which at once exposed the perilous position in which he stood were he to remain in Egypt (Exod. ii. 13—15). He therefore fled to Arabia Petræa, and took refuge with a tribe of Midianites. Thus escaped from the vengeance of Pharaoh, he betook himself to a shepherd's life, and married the daughter of Jethro or Reuel, the priest of the tribe with whom he associated himself. The next forty years of his life were passed in this district, till, while tending the cattle of his father-in-law, a miraculous appearance attracted his notice (Exod. iii. 2—10), and the voice of the God of the Hebrews commanded him to return and accomplish for

his brethren what he had before conceived and vainly endeavoured to execute. On that occasion, however, he followed the dictates of his own passion : but now he was to act as the servant of the Almighty. Aaron, his elder brother, met him, and joined in the mission to their distressed brethren. The Israelites accepted them in the name of I AM. But their deliverance from bondage was not to be easily accomplished, and ten plagues were brought upon the Egyptians before Pharaoh would allow them to depart. After the Israelites had departed, under the leadership of Moses, the Egyptians pursued and overtook them on the shores of the Red Sea. The waters were divided, and a free passage opened for the Israelites. The Egyptians essaying to follow, were overwhelmed by the return of the waters. When God's people were thus miraculously delivered from the rage of their incensed oppressors, and safely encamped in the Peninsula of Sinai, Moses received, from the top of the mount of that name, the law which, with some additions, became ever after the national code. The next forty years of Moses' life were embittered by numerous untoward occurrences ; but the great business which occupied it was that of preparing the people for entering that land which they were to wrest from the dominion of native and warlike tribes. Against these, however, Moses was not destined to lead Israel ; he had incurred the just anger of God, and, as a punishment, was deprived of entering that land which was the goal of his, and his people's, fondest and most cherished hopes. Having appointed Joshua his successor, Moses, by the command of God, went to the top of Pisgah, on the east of Jordan, whence he was allowed to behold, though he was forbidden to enter, the inheritance of his people—the Land of Promise. The spot of his burial in the valley of Beth-

peor, in the land of Moab, remained unknown to the children of Israel (Deut. xxxiv. and Jude v. 9).

See Robinson's *Scripture Characters*, and Millman's *History of the Jews*.

2. "State the circumstances which led to the separation of the kingdoms of Judah and Israel, and the chief events of their subsequent history."

The division of the kingdom, and many disastrous vicissitudes resulting therefrom, are to be traced to the dereliction in conduct that unhappily disgraced and embittered the latter years of King Solomon's reign. As all the calamities brought upon Israel in the time of their judges were providentially designed to exhibit the effects of forsaking the path marked out for them by God; so, for a departure from the paths of his father (1 Kings, xi.), Solomon received the awful intimation that his kingdom would be taken from him, and given to his servant Jeroboam. That the revolts and numerous disturbances in his own reign induced a sincere repentance on the part of Solomon, the book of Ecclesiastes fully testifies. He also acknowledged his folly and the justice of its unaverted punishment in strains of unreserved self-reproval—"Thou didst stain thy honour, and pollute thy seed: so that thou broughtest wrath upon thy children, and wast grieved for thy folly."

But the circumstances which more immediately brought about the separation must be looked for in the history of the commencement of the reign of Rehoboam, the successor and sole heir of Solomon. No self-denial on the part of the people was regarded as a burden when such sacrifice conduced to the splendour and completion of their temple, so ardently looked forward to with emotions of national but holy enthusi-

asm. But when the heavy taxes levied by Solomon were no longer applied to this pious purpose, they ceased to be viewed as legitimate imposts, and became the fertile cause of well-grounded complaints. Consequent disaffections from this cause contributed its portion of unpopularity even to the wise Solomon in his latter days; but when Rehoboam menaced his subjects with a yoke heavier than that his father had imposed, an insurrection was the immediate issue. With ill-advised determination, Rehoboam in vain proceeded to Shechem, and sought the homage of the northern tribes. They appointed Jeroboam to present a violent remonstrance, demanding a redress of grievances. Rehoboam asked the advice of "the old men that stood before Solomon while he lived;" but followed that afterwards given, in opposition, by "the young men that were brought up with him, and stood before him." His haughty and insulting reply to the moderate remonstrance of his subjects caused the immediate alienation of the allegiance of the ten tribes, and he was compelled to flee to the tribe of Judah for refuge. Agreeably to divine pre-arrangement, Judah and Benjamin continued their obedience, and Rehoboam became their first king, under the title of King of Judah, while the "kingdom of Israel" was established, and Jeroboam elected (in accordance with the prophecy of Ahijah) king of the ten tribes (975 B.C.)

Rehoboam levied an army to subdue the revolted tribes; but the Lord sent the prophet Shemaiah to forbid his march. He consequently contented himself with the allegiance of the tribes of Judah and Benjamin, and Jerusalem remained the capital of his diminished kingdom. As tranquility returned the priests flocked, in great numbers, to the holy city, and to the offices of its temple, and were cordially welcomed by their brethren. Though Solomon had left so many

wholesome lessons and warnings for the guidance of his son, yet he followed evil courses, verifying the prophetic reflection, "Who knoweth whether his son will be a wise man or a fool?" (Eccle. ii. 19). He caused a sad defection from the purity of the national religion, and a great portion of his subjects shared in his guilt—the worship of idols. To punish their idolatry, God caused Shishak, king of Egypt, who had, during Solomon's reign, afforded refuge to Jeroboam, to lead an army against Judah, and to conquer it. Rehoboam purchased some degree of forbearance from the Egyptians with the richest treasures of which the temple and the palace could be stripped (2 Chron. xii.) This reverse in his limited prosperity produced repentance in Rehoboam; but on the removal of the Egyptian invaders he returned to his former impieties, and died after an inglorious reign of 17 years.

Jeroboam, whose reign was one of still more hardened iniquity, outlived Rehoboam by five years, and Abijah, the second king of Judah, by two years. But the whole reign of Jeroboam presents an uninterrupted chain of calamitous vicissitudes, and an almost unbroken course of warfare with his rival contemporaries of Judah. During his period of exile in Egypt, the sympathies, manners, and religion of Jeroboam were much modified; and although elected by the people to his high office, he feared that the intercourse which their common religion must occasion between the kingdoms would be the means of transferring the allegiance of his subjects to their legitimate sovereign, the descendant of David. Hence, instead of allowing the people to go to Jerusalem to worship and sacrifice, he set up a golden calf in each of two distant parts of the land, Dan and Bethel, and taught Israel an admixture of worship composed of Egyptian idolatry and the ceremonials of the Mosaic law, selecting priests from the lowest of his

subjects. As a visible token of displeasure, God sent a prophet to announce to Jeroboam that a descendant of David, Josiah, should burn upon the altar of the idolatrous worship the bones of those who had assumed the garb and office of priests. In proof that the prophet's was no ordinary message, he foretold that the altar should be rent asunder, and the ashes poured out, both of which were immediately fulfilled. Jeroboam, burning with resentment, stretched out his hand to lay hold of the prophet, when it instantly withered: but, by the intercession of the man of God, it was restored again. Notwithstanding his being thus forewarned, he continued his evil career till the defeat of the Israelites, by Abijah, and did not long survive that great reverse. After a reign of twenty-two years, Jeroboam was succeeded by his son, Nadab, whose imitation of the evil courses of his father was cut short at the end of two years, by assassination. Thus terminated the house of Jeroboam, in accordance with the prophecy of Abijah.

But the extermination of the house of Israel's first sovereign—although so plainly a visitation of God's wrath upon him and his son, for introducing and fostering idolatry—did not effect the re-establishment of pure worship. The whole seventeen who succeeded Nadab followed, more or less, in the steps of Jeroboam, and maintained the idolatry he had established at Dan and Bethel. Baasha, actuated by the same jealous fears as those which had induced Jeroboam to erect his idol temple, would not allow his subjects to attend the religious festivals at Jerusalem, and built a fortress at Ramah, in order to intercept those who attempted to visit the holy city. Elah succeeded his father; but fell by the hand of Zimri, as Nadab had fallen by that of Baasha. Zimri's usurpation continued only seven days, at the end of which he perished in the

flames of his own kindling, in a fit of despair at the prospect of falling into the power of his rival, Omri. Although against Omri is recorded, that "he wrought evil in the sight of the Lord, and did worse than all that were before him," he was succeeded by a son still more wicked. Great as had been the sufferings of the people of Israel, in consequence of electing wicked rulers, they were visited by a more signal manifestation of God's displeasure. The daring impiety of Ahab, and the ready acquiescence of his people in the profanations and superstitions which he, at the instigation of his wife, Jezebel, set up in the palace of the national religion, provoked the retribution of their forsaken and only true God, who visited the land with a drought of three years' continuance, and a grievous famine. The miracles and teaching of the prophet Elijah, illustrated this reign of unprecedented corruptions; and his translation to heaven without tasting the pains of death, as in the case of Enoch, afforded his contemporaries, in an age of gross and wilful spiritual blindness, a striking memento of the high destiny to which they may aspire, though they may not expect exemption from death, who live in holy obedience to their Creator. Ahab was killed in battle with the Syrians, as had been foretold to him by Micaiah the prophet. His sons, Ahaziah and Jehoram, each filled the throne for a short period, when Jehu completed the series of divine judgments against the apostate and hardened house of Ahab, by putting them all to death, and assuming the government. His partial reforms were nullified in the reign of his son, Jehoahaz, whose wickedness was punished by the oppressions of the Syrians, till the anger of God was averted by the repentance of Jehoahaz and his people. Joash, the next king, was successful in curbing the rapacity and ambition of his Syrian neighbours. Jeroboam concluded

a troubled reign with similar success, for while his idolatry was punished by desolating ravages on the part of the Syrians, on turning to the Lord, fresh examples were afforded, that "righteousness exalteth a nation, but sin is a reproach to any people." Zachariah, Shallum, Menahem, Pekahiah, Pekah, and Hoshea, successively held the throne amid turbulence and treason, that ended in inextricable confusion. The kingdom of Israel had thus lasted two hundred and fifty years, each of which had afforded eminent instances of the long-suffering of Jehovah, and of the hopeless and hardened impenitence of his chosen people. But his truth and justice, conspicuous as his mercy, were fearfully vindicated, and Israel was finally scattered among the nations; Shalmanezzer, king of Assyria, being the instrument of their dispersion (Ezek. xii. 15; Deut. xxviii. 64; 2 Kings xvii.)

The kingdom of Judah presents a similar history, and was punished with a like series of judgments and final overthrow to those which have been mentioned in connection with the sister and rival kingdom of Israel. Between the beginning of David's reign and the destruction of the temple of Jerusalem, by Nebuchadnezzar, is an interval of 468 years; and of 388 years from the defection of the ten tribes. The same proneness to idolatry and desertion of a rational worship, with its ever recurring advantages to work wickedness with a high hand, undeterred by its inevitably disastrous consequences, signalised most of the twenty sovereigns of the kingdom of Judah. It has already been mentioned, that Rehoboam's son was punished by the plunder of the temple by Shishak, king of Egypt (2 Chron. xii.) Abijah's heart was not perfect with God (2 Chron. xii.) Asa caused a more honourable estimate (1 Kings xv.), but did not escape severe censure for the want of trust in the Giver of all good

things (2 Chron. xvi.) Jehosophat exhibited laudable zeal in the service of God, and the amendment of the popular manners, but entailed a long train of evils on his family and people, as well as personal danger, by his ill-advised alliance with the idolatrous house of Ahab (2 Chron. xvi. ; 1 Kings xi.) Jehoram, Ahaziah, and Athaliah (daughter of Ahab and wife of Jehoram), emulated the worst sins of their kindred of the house of Ahab (2 Chron. xxi. ; 2 Kings viii. ; 2 Chron. xxii.) Joash, under the guidance of the high priest, Jehoiada, began his reign well, but disgraced the latter part of it by the worst of crimes (2 Kings xi. ; 2 Chron. xxiii. and xxiv.) Amaziah similarly began with reforms, and concluded his reign with backslidings, which brought on him and his kingdom a fearful calamity ; his palace was pillaged, himself slain, and the temple stripped of its richest ornaments (2 Chron. xxv.) The succeeding reign manifests the danger of continued success and prosperity to a good man. Uzziah tarnished his otherwise exemplary reign by a wicked interference with the sacred offices, the performance of which only divine authority could make lawful, as was punished by deposition from the kingly functions, and the infliction of that most loathsome of all diseases, leprosy (2 Kings xv. ; 2 Chron. xxvi.) Jotham, the next king, is distinguished from all the other kings of Judah in having no evil laid to his charge—but his subjects were yet corrupt. Ahaz revived all the worst pollutions of heathenism, even to the burning his children in the fire to Moloch. Hezekiah brought back the kingdom to the acknowledgment and obedience of the true God, and thereby secured the usual blessings of such reforms to his distracted kingdom (2 Kings xviii. to xx. &c.) Manasseh revived all the abominations which his father had extirpated, and filled Jerusalem with consternation by his savage butcheries of innocent persons, but

eventually repented, and found mercy (2 Chron. xxxiii.) Amon imitated the worst parts of his father's reign, but not his amendments. Josiah, the son of a wicked father, was distinguished for piety and zeal for the honour of God and the reformation of his people. Jehoahaz (or Shallum) was equally as remarkable for wickedness, as his father Josiah, had been as a pattern of holiness (2 Kings xxiii.) He was carried captive to Egypt, and his brother Jehoiachim, who succeeded him, shared a similar fate, by his capture and removal to Babylon, where he died miserably, as had been predicted by Jeremiah, whom he had attempted to murder. Zedekiah, another son of the good Josiah, completes the catalogue of the kings of Judah. When the sceptre fell to his hands it represented a mere wreck and remnant of the extended sway and strong dominion of the earlier kings of God's chosen people. This diminished sway was finally terminated by the Assyrians, who carried away Zedekiah and his people to Babylon, B.C. 588.

3. "Describe the tabernacle of Moses, and the sacred things which it contained."

The tabernacle of Moses, or sanctuary, as it and the temple which took its place were termed, was a moveable building, partaking of the nature of a tent, and consisting of pillars and boards overlaid with gold, and set in sockets of silver. The east end, in which was the entrance, was covered with curtains of embroidered linen. The tabernacle was thirty cubits, or about fifty-four feet in length, nine cubits, or sixteen feet in width, and ten cubits, or eighteen feet high. Most minute directions were received by Moses for the erection of this building, during the forty days he was in peculiar communication with the Deity upon Mount Sinai. "Let them make a sanctuary, that I may dwell

among them" (Ex. xxv. 8). According to the pattern shown was it made (Heb. viii. 5). The covering consisted of four different kinds of curtains; the first, or inner curtain, of fine linen; the second of goat's hair; the third of rams' skins, dyed red; and the fourth, or outer covering, was made of badgers' skins.

The tabernacle stood within a rectangular space of ground, called the Court of the Tabernacle, one hundred cubits in length, and fifty in breadth, enclosed by curtains, suspended upon pillars placed at regular intervals. The interior consisted of two compartments, the "holy place," and the "most holy place." These were separated by "a vail of blue, purple, scarlet, and fine linen, of cunning work," and wrought figures of cherubim. Into the holy place the priests entered continually, to perform the duties of their office; but into the most holy but once in the year, to make supplication for the people (Heb. ix. 6, 7).

There were sacred vessels and instruments in the court of the tabernacle, in the holy place, and in the holy of holies; they consisted, for the most part, of gold, brass, silver, and wood. Those in the court were the *laver* for the cleansing of the priests (Ex. xxx. 18—21), and the altar of burnt-offering (Ex. xxvii. 1—5), upon which fire continually burned. In the holy place were the altar of incense, the candlestick, with its sacred apparatus, the lamp, the table, and its furniture. In the holy of holies was the mercy seat, overshadowed by the wings of the two golden cherubims; the mercy seat was placed upon the ark of the testimony, in which were deposited the two tables of stone, Aaron's rod, and the preserved pot of manna. The exact position of these various appendages to the tabernacle are most minutely described in the chapters to which we have referred, as is likewise the distribution of the several tribes around the court.

Moses was forty days receiving instructions for building the tabernacle; a circumstance worthy of remark, not only as indicative of the elaborate splendour of the building in which God manifested himself to his chosen people; but that it, as the representative of the world of grace, was a more magnificent work than even the creation of the world itself, the latter being completed in six days (see Commentary of the Religious Tract Society).

4. "By whom were Damascus, Nineveh, and Babylon taken, and by which of the prophets was the destruction of each foretold?"

Damascus was taken, and the kingdom of Syria subverted, by Tiglathpileser, king of Assyria, known in profane history under the name of Arbaces. See 2 Kings xvi. and 2 Chron. xxviii. This event was foretold by the prophet Amos, ch. i. verse 5.

The destruction of Nineveh was foretold by Jonah (iii. ch.), Nahum (ii. and iii.), and Zephaniah (ii. 13). The agent of the accomplishment of these predictions was Nabopolassar, or Nebuchodonosor, king of Babylon.

Babylon was taken by Cyrus, the Persian (539 B.C.), exactly fifty years after its people had destroyed the city and temple of Jerusalem. Many minute circumstances in relation to the fate of Babylon had been predicted, for which see Isa. xiii. 17; xxi. 2; Jer. ii.; also Commentary, published by Religious Tract Society.

SECTION II.

1. "Give a short account of the several appearances on earth of our Lord Jesus Christ after his resurrection."

Our Lord showed himself, after his resurrection, to his disciples only—or to his immediate attendants

during his ministry. But many "infallible proofs" are mentioned by the evangelists; and of these examples are given in their narrative of the several appearances of their Master after his resurrection. In fulfilment of his own words—"Destroy this temple, and in three days I will raise it up"—He ate and conversed with ten of His apostles together ere the close of that third day. He appeared :—

1st. To Mary Magdalene, John xx. 14; Mark xvi. 9.

2nd. To the other women, Matt. xxviii. 9.

3rd. To Peter, 1 Cor. xv. 5; Luke xxiv. 34.

4th. To two of his disciples as they were going to Emmaus, Mark xvi. 12, 13; Luke xxiv. 13—32.

5th. To the apostles, in the absence of Thomas, 1 Cor. xv. 5; Mark xvi. 14; Luke xiv. 36; John xx. 19—24.

These five are recorded of those that took place on the day of the resurrection.

6th. To the eleven apostles, John xx. 26—29.

7th. To Peter, Thomas, Nathanael, James, John, and two others at the Sea of Tiberius, John xxi. 1—14. The last verse here referred to states that this was the third time he showed himself to his disciples—i.e., to his apostles when most of them were assembled.

8th. To the disciples on a mountain in Galilee, Matt. xxviii. 16.

9th. To more than five hundred brethren at once, 1 Cor. xv. 6.

10th. To James, one of the apostles, 1 Cor. xv. 7.

11th. To the assembled apostles, 1 Cor. xv. 7.

12th. To the apostles at his ascension from Mount Olives, Luke xxiv. 50, 51; Acts i. 9, 10.

13th. To St. Paul, Acts x. 3—5; xxii. 8; 1 Cor. xv. 5—8.

For much interesting information relative to these thirteen recorded appearances of our blessed Saviour,

after his resurrection, see Barnes' Notes. Note at the end of the Gospel of St. Matthew. See, also, Macbride's *Diatessaron*, part vii., for many valuable suggestions in reference to the testimony of our Lord's resurrection, and the minute discrepancies in the Evangelists' narrations.

2. "What were the chief subjects of our Lord's predictions? Quote, as nearly as you can, the words of one of them."

One of the distinctive elements in the office of CHRIST was that of a prophet. His advent was the consummation of the testimony of the prophets; yet he fully answered to the description given by Moses, "The Lord thy God will raise up unto thee a prophet" (Deut. xviii. 15). The following are the chief illustrations of our Saviour's prescience:—

1st. His request to his disciples after a night's stay at Bethany—"Go into the village (Bethphage) over-against you, and straightway ye shall find an ass tied," &c., Matt. xxi. 2, 3; Mark xi. 4—6; John xii. 1—19.

2nd. The destruction of Jerusalem, Matt. xxiii. xxiv.; Mark xiii.; Luke xxi.

3rd. His betrayal, Matt. xxvi. 23, 47—49; John xiii. 26.

4th. His disciples forsaking him, John xvi. 32; Matt. xxvi. 56.

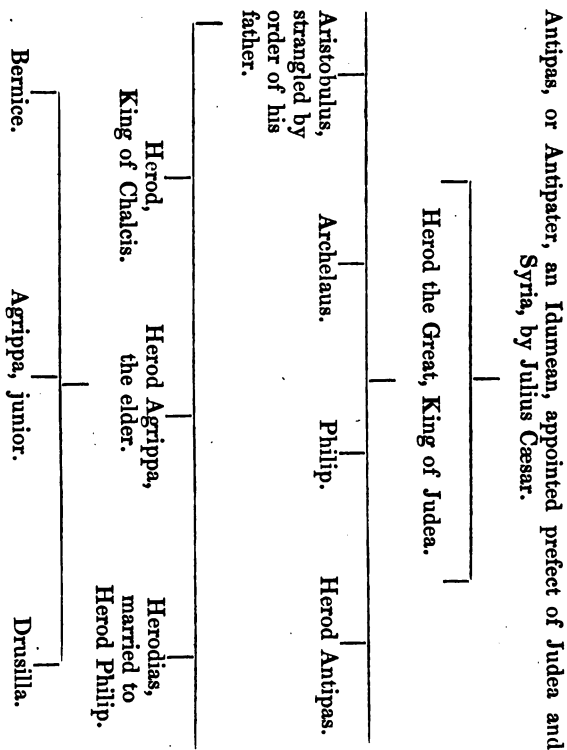
5th. Peter's denial, Mark xiv. 30.

6th. The Saviour's sufferings, place of his death, his resurrection, &c., Luke xviii. 31—23; Matt. xvi. 21; Luke xxiv. 18; Mark x. 33; Mark ix. 12; John iii. 14; John ii. 19, 20; Matt. xxvii. 62, 63; John xvi. 16, 22; Matt. xxvi. 32; John xx. 17.

Thus, it is seen that the chief subjects of our Saviour's predictions were his sufferings, and the glory that should follow them.

3. "Name the different members of Herod's family mentioned in Scripture."

The following table of the persons of Herod's family is extracted from a condensed Scripture History published by the Christian Knowledge Society—a useful little work for schools :—



4. "Explain the parable of the labourers in the vineyard."

This parable, which commences the twentieth chapter of St. Matthew's Gospel, should be connected in arrangement, as it is in sense with the last verse of the preceding chapter; for it was given by the Saviour as prophetically illustrative of the import of that verse, "Many that are first shall be last, and the last shall be first." By the kingdom of heaven is meant the reign of Christ in the hearts of his people on earth: and the reward which the labourers received refers to the bountiful dispensation of God's mercy to the members of his church, and not to the reward laid up for them in heaven, where that reign will be perfected. The usual mode that the Saviour chose for conveying instruction to his audience was to draw their attention to some natural and familiar object to remark thereon, and then to adduce the moral thereof. Thus, his hearers were all familiar with the manner in which the proprietors of the numerous vineyards in Judea added to the number of their labourers. Many, too, perhaps, had trusted to the generosity of their employer when engaged by him after the customary hour for commencing the day's work. The day with the Jews was reckoned from daylight in the morning till evening twilight; but since the variation in the length of day and night in Palestine is very slight, their day generally commenced at six in the morning: hence, the third, sixth, ninth, eleventh hour, respectively corresponded to our nine, twelve, three, and five o'clock. It was immaterial to the labourers which of them were first remunerated, providing each received his due; but to give point to the application of the parable, those last hired are represented as being first paid.

The application of the parable is varied and exten-

sive. It is certain, however, that, primarily, it was directed against the Jews. They had been early called into the vineyard of God's mercy and providence; they had little appreciated the advantages secured to them by the exclusive knowledge of the goodness of the Householder. In the same manner, therefore, as the evil eye was apparent in the envious labourers, so should the astonishment and indignation of the Jews be excited when the "partition wall" of their exclusive privileges should be removed, and a beneficent God revealed to those who had before lived in the shadow of darkness.

As a judicial punishment inflicted upon the Jews, for their rejection of the long-offered mercies, they should be cast off, and the Gentiles admitted to a participation of those mercies. A similar intimation of our Saviour is recorded by St. Luke, ch. xiii. 24—30. Manifold had been the revelations to the Jews; they were called at the first hour: but although rejecting the calls, they murmured against the Lord of the vineyard when placed second to the Gentiles, in consequence of the eager acceptance with which the latter seized the proffered benefits.

The parable offers no encouragement to those who are lulling themselves in the pleasures of sin, and looking to the eleventh hour at which to work for the reward. It is true, that those who worked but one hour received the same as those who had borne the heat of the day. But it must be remembered, that when the question was put, "Why stand ye here all the day idle?" the answer returned was, "*Because no man hath hired us.*" This plea cannot be made by those who console themselves with the idea of deferred repentance. The parable is inapplicable to those nominal Christians who have, ere the third hour, been called to

labour in the vineyard, by being introduced as members of Christ's visible church. The penitent thief on the cross was a recipient of pardoning love ; but he accepted the means of grace as soon as offered. He who, in the eleventh hour, pronounced the gracious words, "This day shalt thou be with me in Paradise," also declared that, "Unto whom much is given of them should much be required." To those who have embraced the high privilege of an early call, the Almighty has given the assurance, "I love them that love me, and those that seek me early shall find me."

SECTION III.

1. "Draw a map of Jerusalem and its vicinity, illustrative of the gospel history."

See Geographical Paper, Section iv. Ques. 4, Appendix i. Every schoolroom should be furnished with a plan of Jerusalem, similar to that accompanying the "Map of Palestine," published by the Christian Knowledge Society.

2. "Mention, in the order of time, the chief epochs of Scripture history, and give their dates."

St. Matthew, in prefacing his gospel with the genealogy of our Saviour, divides the history of the Jews into three periods, of about fourteen generations each. The first and third periods consist of the history of private individuals, and the second of kings. From the call of Abraham to the commencement of the reign of David, embraces a period of 866 years ; from David to the Babylonish captivity, 438 years ; and from the captivity to the birth of the Saviour, 607 years.

The usually recognised epochs of Scripture history, with the period that elapsed between each, are as follows :—

		B.C.
The creation	.....	4004
The flood ..	} 1656 years.	
	.....	2348
	} 427 years.	
The call of Abraham	.....	1921
	} 430 years.	
The deliverance from Egypt	.....	1491
	} 479 years.	
The foundation of the temple	..	1012
	} 476 years.	
The restoration of the Jews by Cyrus	.....	536
	} 536 years.	
The advent	.....	—
See "Nicholls' Help."		

But the following extract from the Fifth Reading Book of the Irish School Society gives a more convenient division of the 4004 years that elapsed from the creation to the advent, since it is more comprehensive, and more easily remembered :—

"At the middle of this period, or two thousand years before Christ, and two thousand after the creation of the world, Abraham was born ; and the call of Abraham was the commencement of that important dispensation of Providence by which one family was separated from the rest of the world, increased to a nation, planted in a central place of the earth, that they might preserve among them the knowledge of the name, and character, and law of the true God, and ultimately diffuse it among the rest of mankind. In the middle of the period between the creation of the world and the birth of Abraham, or about the year B.C. 3017, Enoch was translated to heaven as a token of the favour and approbation with which God regarded his devout and holy character. In the middle of the period between the birth of Abraham and the birth of Christ, or about the

year B.C. 1004, Solomon's temple was finished. This period marked the fulfilment of the promises made to Abraham, in their literal sense; for then, and not till then, did his seed reign in peace and prosperity, from the great river Euphrates to the shores of the Mediterranean Sea. Thus the whole period of four thousand years is divided into four parts, of a thousand years each, every successive period commencing with a remarkable event—namely, the creation—the translation of Enoch—the birth of Abraham—and the completing of Solomon's temple.

“The four periods thus distinctly marked may be further conveniently divided into eight, each of 500 years. So little is recorded respecting the first two periods of a thousand years, that it is of less importance to divide them into half thousands. We remark, however, that the first thousand years—namely, from the creation of the world to Enoch—is divided nearly equally by the birth of Jared, the fifth descendant from Adam, which was, according to the common chronology, in the year B.C. 3544. The second thousand years—namely, from Enoch to Abraham—is divided nearly equally by the denunciation of the deluge, and the commencement of the building of the Ark. The divisions of the latter two periods of a thousand years are marked by very important eras. That which intervened between Abraham and Solomon is divided by the mission of Moses to the Israelites—their deliverance from Egypt, and the giving of the law at Mount Sinai, which is determined to the year 1490, or nearly 1500 years B.C. The last period of a thousand years, or that which intervened between Solomon and the birth of Christ, is equally divided by the building of the second temple, after the return of the Jews from the captivity of Babylon, to the year B.C. 515. Thus the whole period, from the creation of the world to the birth

of Christ, is divided by remarkable eras, into eight periods, of about 500 years each, as in the following table :—

ERAS.	A.M.	B.C.
1. Creation	—	4000
2. Jared.....	500	3500
3. Enoch	1000	3000
4. Noah.....	1500	2500
5. Abraham	2000	2000
6. Moses	2500	1500
7. Solomon	3000	1000
8. Ezra	3500	500
9. Jesus Christ	4000	A.D."

3. "Describe, accurately, the ceremonies of the great day of atonement."

The tenth day of the seventh month was appointed as a general day of fasting, humiliation, repentance, and atonement for the people, on which the whole nation were to afflict their souls on account of their sins. On this day the high priest, in his plainest garments, was to enter into the holy of holies, and sprinkle the blood of a peculiar sacrifice upon the mercy seat, before the Lord. Two goats were selected to bear the sins of the whole nation—one was to be sacrificed as prefiguring the death of Christ for the sins of mankind; the other was to be set free, to escape into the wilderness, to denote that the sins of the people were pardoned, and their deserved punishment far removed; thus typifying Christ's taking upon him the transgressions of all mankind. On this great day of atonement, in the year of Jubilee, the trumpet of liberty to the inhabitants was sounded throughout the land.

For the details of the ceremonies of the great day of atonement, see Lev. xvi., xxiii. and xxiv; Numb. xxix.; also Nicholls' Help.

4: "To what kinds of government were the Israelites successively subject?"

The Israelites were selected as God's peculiar people, chosen when there was but the germ of a nation (one person), and fostered till they became a people many and great. The land they possessed was held by inalienable tenure from God; he therefore claimed their allegiance to his sovereign power, "I will be thy king; where is any other that may save thee in thy cities? and thy judges of whom thou saidst, Give me a king and princes" (Hosea xii. 10)?

But in the practical working of the sovereign power in the theocracy a portion of it was delegated to patriarchs, and afterwards to judges, as immediate vicegerents of God. Hence the government may be divided into two parts, legislative and executive; the former was wholly reserved by God to himself, and the latter administered by delegates, principally appointed directly by the Almighty. To the power exercised by these the question refers:—

During the early part of the existence of the Hebrews, their government was patriarchal, and may date from the call of Abram (B.C. 1921), to the death of Jacob (B.C. 1689), and probably with some modification it obtained during the whole 430 years, from the time Abraham passed over into the promised land to the period at which Israel left the house of bondage, to take the promised inheritance. Servitude and degradation, however, almost obliterated every trace of self-government during the latter years of the Egyptian bondage. From the period of leaving Egypt till the conquest of Canaan (B.C. 1491—1443), the Israelites formed chiefly a military band, under the successive leaderships of Moses and Joshua; and consequently were more or less under a military government. From the death of Joshua to B.C. 1095, when Saul was appointed king, the

government was intermittent-judicial. The title of king was retained by the governor till the Babylonish captivity (B.C. 588). After the restoration (B.C. 547), the Jews were subject to a government composed of an admixture of foreign oppressions and native election, till the advent of our Lord, when the sceptre passed into the hands of the Romans. (See "Nicholls' Help.")

SECTION IV.

"What offices are intimated under the name 'Christ,' and how have those offices been fulfilled?"

The name 'Christ' is a Greek word, corresponding to the Hebrew Messiah, and signifying anointed. Thus the Saviour is termed either the Messiah or the Christ. The term denotes his offices of Prophet, High Priest, and of King. Anciently, when kings and priests were set apart for their respective offices, they were anointed with oil. This was the case with the first high priest and his son (Lev. iv. 3; vi. 20; Ex. xxviii. 41; xxix. 7), with the first king of Israel and his successors (1 Sam. ix. 16; xv. 1; 2 Sam. xxiii. 1.) Anointing, therefore, became identical with consecrating or setting apart to any holy office. Daniel applied the term to the Saviour (Dan. ix. 24). Consecration to a holy office was also denoted by some other emblematical operation than that of actually anointing with oil. Thus, the mantle was no less an emblem of the Holy Spirit's influence in the case of Elijah (1 Kings xix. 19—21), when he was set apart as a prophet, and the successor of Elijah, than was the oil in the case of Aaron, when he was set apart as the high priest of Israel.

He who received the Holy Spirit *without measure* (John iii. 34) and otherwise than emblematically, (Matt. iii. 13—17) was at his baptism anointed to the threefold office intimated by his title, 'Christ:'—"As

our Prophet, he instructs us in our duty ; as our Priest, he offered, once for all, the effectual spotless sacrifice of himself for our sins ; and as our King, he governs us, ruling over us by his law, and in us by his Spirit."—(Archdeacon Sinclair's Catechism.)

For a development of this answer in reference to the office of Christ as Mediator between God and man, under the three heads, Prophet, Priest, and King, study an extract in "Nicholls' Help," page 47, from "Bishop Butler's Analogy."

2. "What is a type, and what an antitype? Illustrate your meaning by a reference to the passage of the Israelites through the Red Sea, the brazen serpent, and the prophet Jonah."

Type (Gr. *tupos* ; from *tupto*, I strike), in its original answered very nearly to our English word, impression. Its acquired meaning is, a form or figure made to resemble something else ; thus, the shadow of a person may be termed his type. But in the same manner as these *may* be called types of the individual they represent, so may one person or *event* be considered a type of another in some peculiar respects. As Scripture type, however, is *not* merely a symbol, sign, or representative of a person or event ; the type must *foreshadow* that person or event : it is therefore a prophetic resemblance, and further, a resemblance acknowledged by "express words of Scripture, or proved by a sober and cautious interpretation, where the words of Scripture are less distinct and clear." "The leading events in the New Testament are, for wise and gracious purposes, predicted in the Old. Sometimes these events are foretold in words, more or less clearly, as it seemed good to the Holy Ghost, who spake by the prophets. At other times the events are foreshadowed by other *facts*, which occurred long before. It is when one thing or person thus pre-

figures another that it is called a type ; while the thing or person thus foreshadowed is termed the antitype ; or, in other words, that which, when set over against the type, is found to resemble it, and correspond with it. They answer to each other as the shadow answers to the substance.”—(Le Bas.) The passage of the Israelites through the Red Sea was a typical baptism, 1 Cor. x. 2. “ They were, by passing under the cloud (yielding themselves to its guidance), and through the sea, as it were baptised or initiated into the religion promulgated by Moses ; and thus thoroughly recognised his Divine mission, and bound themselves in future to obey its laws.”—(Hammond.) They were passing from bondage to freedom ; so the soul, by passing through the waters of regeneration, and yielding to the overshadowing influence of the Holy Ghost, not only becomes initiated into the religion of Christ and bound to its precepts, but becomes a recipient of the benefits of Christ crucified—a passer out from the bondage of death to the freedom of life. That the passage of the Israelites through the Red Sea constituted a type, foreshadowing a Christian ordinance, is evident from the words of St. Paul above referred to.

That the raising of the brazen serpent in the wilderness (Num. xxi. 6—9) was typical of Christ’s crucifixion, we have evident proof ; thus, on his own authority (John iii. 14, 15), “ As Moses lifted up the serpent in the wilderness, even so must the Son of Man be lifted up ; that whosoever believeth on him should not perish but have everlasting life.”

So also have we the testimony of the Saviour, that the prophet Jonah was eminently a type in the circumstance of his being three days and three nights in the belly of the fish : “ So shall the Son of Man be three days and three nights in the heart of the earth” (Matt. xii. 40).

The three remarkable instances quoted answer to the definition of a type :—1st, they symbolized the antitype ; 2ndly, they took place long before the circumstances they prefigured ; consequently were prophetic, although latently so, as far as is recorded by revealed inspiration of God's dispensation : 3rdly, Scripture expressly states that they were ordained as types. Yet in these, as in all types, every attendant circumstance must not be considered as part of the prefigurement of the antitype. Thus, the destruction of the Egyptians while essaying to follow Israel, by no means indicated the establishment of an exclusive ordinance. This idea would be in opposition to that conveyed in the gracious words of Christ, " Come unto me, all ye that are heavy laden, and I will give you rest " (Matt. xi. 28). Similar points of difference may be found in reference to the attendant circumstances of the other types.

3. " In what passages of the New Testament are the following duties most strongly inculcated :—Self-denial, consistency, discretion, courteousness, loyalty, and diligence in temporal employment ?"

Self-denial :—Matt. v. 29, 30 ; vi. 19—24 ; xviii. 8, 9 ; xix. 12 ; Mark viii. 34, 35 ; ix. 43, 47 ; Luke xviii. 22 ; Rom. viii. 13 ; 1 Cor. ix. 27 ; x. 27 ; Col. iii. 5 ; Titus ii. 12, 13.

Consistency :—Rom. xiv. 5, 22 ; John ii. 4 ; 1 John ii. 4 ; iv. 20 ; 2 Cor. vi. 14, 15.

Discretion :—Titus ii. 4, 5 ; 1 Tim. iii. 5, 11, 12.

Courteousness :—Rom. xii. 10 ; Eph. iv. 32 ; John xiii. 35 ; 1 Peter iii. 8 ; Col. iii. 12.

Loyalty :—Heb. xii. 17 ; 1 Peter ii. 13, 14 ; Matt. xxii. 21 ; Rom. xiii. 1 ; Titus iii. 1.

Diligence in temporal employment :—Eph. iv. 28 ; Acts xx. 35 ; 1 Thess. iv. 11 ; 2 Thess. iii. 8, 11, 12.

4. "Show from the Holy Scripture that the Holy Spirit is a person, and ought to be worshipped."

The Rev. W. Jones, in his "Catholic Doctrine of a Trinity," has given no less than twenty-six arguments illustrative and in proof of what this question requires to be shown. We recommend the study of this valuable little work, published by the Christian Knowledge Society.

Spiritual birth is ascribed, without the change of a single letter, to God and to the Spirit, John iii. 6; 1 John v. 4; Divine authority is ascribed to the Holy Ghost, compare Acts xiii. 2; Heb. v. 4; Rom. i. 1; and Tim. i. 1. Christ has directed us to pray to the Holy Ghost as the Lord of the harvest. Compare Matt. ix. 38; Acts xiii. 4. The Holy Ghost is God and Lord to be blessed or praised. Compare Luke ii. 26; v. 28.

"God the Spirit dwells in you."—Compare John xiv. 17; 1 Cor. xiv. 25. Scripture given by inspiration of God, viz. of the Holy Ghost, compare 2 Tim. iii. 16; 2 Peter i. 21; also John vi. 45; 1 Cor. ii. 13, for the Spirit's teaching. Further, compare Acts v. 3. with v. 4; 1 John iii. 21, with 24; 1 Cor. iii. 16, with vi. 19; Matt. iv. 1, with Luke xi. 2—4; 2 Cor. i. 3, with Acts ix. 3; with John xiv. 26, with John iv. 24, and with 1 John v. 6, Deut. vi. 16; and Matt. iv. 7, with Acts v. 6, Gen. vi. 3, with 1 Peter iii. 20; Acts iv. 24, 25, with 2 Peter i. 21; and Luke i. 68, 70; Luke i. 32—35, where Christ is called the Son of God, because begotten by the Holy Ghost.

From the study of these passages cited, it may be inferred that the Holy Ghost, as a part of the Godhead, is to be worshipped. Passages in our Lord's history are numerous in which he inculcates prayer to God, i. e. to the Triune God, for the gift of the Holy Spirit, as in Luke xi. 13.—See "Nicholls' Help."

ANCIENT AND MODERN LANGUAGES.

Replies to the following papers could subserve no useful end, as the translation of a passage, and showing the infinitives of a few verbs, with the other requisites of the questions, would afford no clue to a similar performance in respect to another series of passages. To anticipate solicitous surmises already afloat in reference to the German and the Greek papers, it is necessary to be as explicit and candid as the importance of these languages to a teacher demands, and more so than the weight of the remarks deserves. We would not then be understood to assume the requisite philological knowledge to enable us, from our own personal resources simply, to furnish appropriate answers to all four of these papers. Our first idea was to obtain efficient assistance to supplement our deficiencies; but upon reviewing the papers themselves, it appeared that no useful aid could be afforded by the publication of the answers required. These papers are not analogous in character to the others of the series; for to those who have a knowledge of the subject matter of the papers on these four languages, formal replies would be superfluous; and to the mere English reader they would be useless. Some of the preceding questions are open to similar objections, but the same cannot be said in reference to any of the papers *as a whole*. It was not our intention when commencing this note—nor is it now—to

write a second preface ; but still it appears requisite to state that, for the sake of completeness, it was desirable to give solutions, subservient to the general design of the performance, which in some other respects were scarcely needful. We publish the questions themselves, that the student may be forewarned of the kind of knowledge he must bring to bear on the determination of his position, as the result of an examination. The following works are among the best of their kind for the study of the subjects on which they treat ; but the student is reminded of attempting the hopelessness of attaining useful much knowledge of a modern language without the assistance of a teacher.*

FRENCH.

	s.	d.
Cobbett's French Grammar - - - - -	5	0
Delille's Grammar - - - - -	5	6
Boyer and Deletanville's Dictionary - - - - -	12	0
Smith's Dictionary - - - - -	5	0

LATIN.

Zumpt's Grammar, by Kenrick - - - - -	10	6
The Bromsgrove (Crude Form) Grammar, by Jacob - - - - -	4	0
Henry's First Latin Book, by Rev. T. K. Arnold - - - - -	3	0
Introduction to Prose Composition, by do. - - - - -	8	0
Riddle's Dictionary - - - - -	9	0

* It may be of advantage to teachers residing in, or near, town, to learn that classes have been formed at the St. Thomas Charterhouse Schools, Goswell Street, under a trained master, who has lately returned from the Continent. These classes have been undertaken with the express object of affording teachers an opportunity of acquiring a knowledge of the French and German languages.

s. d.

GERMAN.

Tiark's Grammar	- - - - -	6	0
———Exercises	- - - - -	3	0
Key to Exercises	- - - - -	2	6
Ollendorf's Grammar (abridged)	- - - - -	9	0
Flügel's Dictionary (abridged)	- - - - -	9	0
Kaltschmidt's Dictionary	- - - - -	9	6
Rabenhorst's Dictionary, by Nœhden	- - - - -	7	0

GREEK.

Kühner's Grammar (abridged), by Millard	- -	9	0
The Bromsgrove (Crude Form) Grammar, by Jacob	- - - - -	8	0
Huntingford's First and Second Exercises	- -	5	6
Arnold's Practical Introduction to Greek Acci- dence	- - - - -	5	6
Liddell and Scott's Lexicon (abridged)	- - -	8	0

FRENCH.

The following Note preceded each of the Four Languages:—

Success in performing the exercises required in this paper will be received as an evidence of merit in any Candidate, but it is not an indispensable condition of his receiving a Certificate.

1. Translate the following passage:—

Ils *arrivèrent*, vers le milieu de la nuit, au pied de leur montagne, dont le sommet était éclairé de plusieurs feux. A peine ils la *montaient* qu'ils *entendirent* des voix qui *criaient*: "Est-ce vous, mes enfants?" Ils *répondirent* avec les noirs: "Oui, c'est nous!" et bientôt ils *aperçurent* leurs mères et Marie, qui *venaient* au-devant d'eux avec des tisons flambants. "Malheureux enfants!" dit Madame de la Tour,

"d'où venez-vous ? dans quelles angoisses vous nous avez *jettes* !" "Nous venons," dit Virginie, "de la Rivière Noire demander la grâce d'une pauvre esclave, à qui j'ai *donné* ce matin le déjeuner de la maison, parce qu'elle *mourait* de faim ; et voilà que les noirs nous ont *ramenés*." Madame de la Tour *embrassa* sa fille, sans pouvoir parler ; et Virginie, qui *sentit* son visage mouillé des larmes de sa mère, lui dit : "Vous me *payez* de tout le mal que j'ai *souffert* !" Marguerite, ravie de joie, *serrait* Paul dans ses bras, et lui *disait* : "Et toi aussi, mon fils, tu as fait une bonne action."

2. Give the infinitive mood of the verbs in italics ; parse each word in the first sentence ; and turn into French the following sentence—"There are many men, who have never seen us."

LATIN.

Translate into English prose :—

Erant in eâ legione fortissimi viri *centuriones*, qui jam primis ordinibus *appropinquarent*, T. Pulfio et L. Varenus. Hi perpetuas *controversias* inter se habebant, uter alteri *anteferretur*, omnibusque annis, de loco, summis simultatibus contendebant. Ex iis Pulfio, quum acerrimè ad munitiones pugnetur : "quid dubitas," inquit, "Varene ? aut quem locum *probandæ* virtutis tuæ exspectas ? hic dies, hic dies de nostris controversiis judicabit." Hæc quum dixisset, procedit extra munitiones, et, quæ pars hostium confertissima visa est, in eam irrumpit. Nec Varenus quidem tum vallo sese continet, sed omnium *veritus* existimationem subsequitur, *mediocri* spatio relicto. Pulfio pilum in

hostes mittit, atque unum ex multitudine procur-
rentem transjicit: quo percusso et *exanimato*, hunc
scutis protegunt hostes, et in illum universi tela
conjiciunt, neque dant *regrediendi* facultatem:
transfigitur scutum Pulfoni, et verutum in balteo
defigitur. Avertit hic casus vaginam, et gladium
educere conantis dextram moratur manum, *impedi-
tumque* hostes circumsistunt. Succurrit *inimicus*
illi Varenus, et laboranti subvenit. Ad hunc se
confestim a Pulfione omnis multitudo convertit.
Illum veruto transfixum arbitrantur. Illic verò
occursat ociùs gladio, cominusque rem gerit Va-
renus; atque uno interfecto, reliquos paullùm
propellit. Dum cupidius instat, in locum inferi-
orem dejectus concidit. Huic rursus *circumvento*
fert subsidium Pulfio: atque ambo incolumes,
compluribus interfectis, summâ cum laude sese in-
tra munitiones recipiunt. Sic fortuna in conten-
tione, et certamen utrumque versavit, ut alter alteri
inimicus auxilio salutique esset, neque dijudicari
posset, uter utri virtute antefendus videretur.

1. Give the derivations of the following words: cen-
turio—controversia—mediocris—multitudo—exa-
nimo—impedio—inimicus—cominus.
2. Parse the following words, and account for their
mood, tense, or case: appropinquarent—antefen-
datur—probandæ—veritus—relicto—regrediendi—
circumvento—auxilio salutique.
3. Describe the arms, offensive and defensive, of a
Roman soldier in the legions of Julius Cæsar.

Translate into English prose:—

Parcus Deorum cultor et infrequens,
Insanientis dum sapientiæ

Consultus erro ; nunc retrorsum
 Vela dare, atque iterare cursus
 Cogor relictos. Namque Diespiter,
 Igni corusco nubila dividens
 Plerumque, per purum tonantes
 Egit equos volucremque currum ;
 Quo bruta tellus, et vaga flumina,
 Quo Styx, et invisi horrida Tænari
 Sedes, Atlanteusque finis
 Concutitur. Valet ima summis
 Mutare, et insignem attenuat Deus,
 Obscura promens ; hinc apicem rapax
 Fortuna cum stridore acuto
 Sustulit ; hic posuisse gaudet.

GERMAN.

Translate the following passage :—

Es war einmal ein alter König, der war krank und dachte : " es wird wohl das Todtenbett sein, darauf ich *liege*." Da sprach er : " *lasst* mir den treuen Johannes kommen." Der treue Johannes aber war sein liebster Diener, und *hiess* so, weil er ihm sein lebelang so treu *gewesen* war. Als er nun vor das Bett *gekommen* war, sprach der König : " getreuster Johannes, ich fühle, dass mein Ende herannaht, und da habe ich keine andere Sorge, als um meinen Sohn : er ist noch in jungen Jahren, wo er sich nicht immer zu rathen *weiss*, und wenn du mir nicht *versprichst*, ihn zu unterrichten in allem, was er wissen *muss*, und sein Pflegevater zu sein, so kann ich meine Augen nicht in Ruhe zuthun. Da antwortete Johannes : " ich *will* ihn nicht *verlassen*, wenn's auch mein Leben kostet."

Da sagte der alte König: "so *sterb* ich *getrost* und in *Frieden*."

Give the infinitive mood of the verbs in *italics*, and parse each word in the first sentence.

GREEK.

Translate into English prose:—

"Ἐλεγε δὲ καὶ τοῖς ὄχλοις, ὅταν ἴδητε τὴν νεφέλην ἀνατέλλουσαν ἀπὸ δυσμῶν, εὐθέως λέγετε, "Ὁμβρος ἔρχεται· καὶ γίνεται οὕτω· καὶ ὅταν νότον πνέοντα, λέγετε, "Ὅτι καύσων ἔσται· καὶ γίνεται. ὑποκριταί, τὸ πρόσωπον τῆς γῆς καὶ τοῦ οὐρανοῦ οἴδατε δοκιμάζειν· τὸν δὲ καιρὸν τοῦτον πῶς οὐ δοκιμάζετε; τί δὲ καὶ ἀφ' ἑαυτῶν οὐ κρίνετε τὸ δίκαιον; ὥς γὰρ ὑπάγεις μετὰ τοῦ ἀντιδίκου σου ἐπ' ἄρχοντα, ἐν τῇ ὁδῷ δὸς ἐργασίαν ἀπηλλάχθαι ἀπ' αὐτοῦ· μήποτε κατασύρῃ σε πρὸς τὸν κριτὴν, καὶ ὁ κριτής σε παραδῶ τῷ πράκτορι, καὶ ὁ πράκτωρ σε βάλλῃ εἰς φυλακὴν· λέγω σοι οὐ μὴ ἐξέλθῃς ἐκεῖθεν, ἕως οὗ καὶ τὸ ἔσχατον ἀποδῶς.

1. Give the derivation of the following words:—
ὑποκριτής—πρόσωπον—ἀντίδικος—πράκτωρ.
2. Parse the following words, and account for their mood, tense, or case:—ἴδητε—πνέοντα—ἔσται—οἴδατε—ἀπηλλάχθαι—παραδῶ—βάλλῃ—ἐξέλθῃς—οὗ—ἔσχατον.
3. Show, by examples, the use of the particle ἂν in Greek.
4. Give the genitive case of the following nouns:—ὄχλος—νεφέλη—καύσων—ὑποκριτής—ἐργασία—λεπτόν.

Translate into English prose :—

Κῦρος μὲν οὖν οὕτως ἐτελεύτησέν, ἀνὴρ ὢν Περσῶν τῶν μετὰ Κῦρον τὸν ἀρχαῖον γενομένων βασιλικώτατός τε καὶ ἀρχεὶν ἀξιώτατος, ὥς παρὰ πάντων ὁμολογεῖται τῶν Κῦρου δοκούντων ἐν πείρᾳ γενέσθαι. Πρῶτον μὲν γὰρ παῖς ἔτι ὢν, ὅτε ἐπαιδένετο καὶ σὺν ἀδελφῷ καὶ σὺν τοῖς ἄλλοις παισὶ, πάντων πάντα κράτιστος ἐνομίζετο. Πάντες γὰρ οἱ τῶν ἀρίστων Περσῶν παῖδες ἐπὶ ταῖς βασιλείῃς θύραις παιδένονται· ἐνθα πολλὴν μὲν σωφροσύνην καταμάθαι ἂν τις, αἰσχρὸν δὲ οὐδὲν οὔτε ἀκούσαι, οὔτ' ἰδεῖν ἔστι. Θεῶνται δὲ οἱ παῖδες καὶ τοὺς τιμωμένους ὑπὸ βασιλείᾳ καὶ ἀκούουσι, καὶ ἄλλους ἀτιμαζομένους· ὥστ' ἐνθὺς παῖδες ὄντες μανθάνουσιν ἀρχεῖν τε καὶ ἀρχεσθαι. Ἐνθα Κῦρος αἰδομυνοέστατος μὲν πρῶτον τῶν ἡλικίων ἐδάκει εἶναι, τοῖς τε πρεσβυτέροις καὶ τῶν ἑαυτοῦ ὑποδεστέρων μᾶλλον πέθεσθαι· ἔπειτα δὲ φιλιππότατος καὶ τοῖς ἵπποις ἄριστα χρῆσθαι.

Name the mood and tense of each verb in this passage ; also the genitive singular and the dative plural of each noun.

APPENDIX I.

The Questions proposed to the Battersea Masters in July, 1847; the Papers of the first Government Examination, which was undertaken with a view of certificating Masters.

ARITHMETIC.

[Only one question in each section is to be answered.]*

The method best suited for explanation to learners is to be preferred, and all the work to appear.

SECTION I.

1. If 670 articles cost £67 17s. 10d., what is the price of each?
2. If 2 cwt. 3 qrs. of sugar cost £7 15s., what is the least price per pound, in current coin, at which it must be sold in order to gain 7 per cent.?
3. If two equally good workmen, and three boys, who also work equally well, by labouring 7 hours a-day perform in 7 days, what the two men alone could do in 10 days by working $8\frac{1}{2}$ hours a-day, what ratio does the work done by a boy bear to that done in the same time by a man?

* This request was placed after the heading of each of the following papers, except the last.

SECTION II.

1. What part of a guinea is equivalent to $\frac{2}{10}$ ths of 6s. 8d.?
2. Reduce 2½d. to the decimal of a pound, and divide the result by 7500.

What is meant by incommensurables?

3. Find, by cross-multiplication (or duodecimals), the area of a board, whose length is 6 ft. 11 in., and breadth 1 ft. 6 in.

State clearly what the answer is. Explain the steps of the process, and the interpretation of the result.

Do you see any reason why, in representing quantities by means of numbers, incommensurables should occur?

SECTION III.

1. Explain the reason of each process employed in multiplying 607 by 404.
2. Show that a fraction may be regarded as a quantity resulting from the division of the numerator by the denominator; and also that, if the numerator of a fraction be multiplied by any number, the result is equivalent to that obtained by dividing the denominator of the same fraction by the same number.
3. Explain the reason of the rules for extracting the square root of any number.

MENSURATION.

SECTION I.

1. If the sides of a rectangle be 25 feet, and 13 feet 3 inches, what is the side of a square, whose area is the same as that of the rectangle?

2. What is the area of a right-angled triangle, whose hypotenuse is $84\frac{1}{2}$ yards, and one of the remaining sides $30\frac{1}{2}$ yards?
3. One angle of a four-sided field is a right angle, and the sides that include the right angle are 10·47 chains and 14·6 chains respectively; the remaining sides are 8·57 chains and 13·64 chains respectively. Required the area of the field.

SECTION II.

1. The circumference of a circle is 47 yards and 2 feet 5 inches. What is its area?
2. The length of the slant side of a cone is 15 feet 7 inches, and the diameter of its base $15\frac{1}{2}$ inches. Required its solid content.
3. A round hole, $14\frac{1}{2}$ yards in diameter at the bottom, is dug in a level field; its sides have a regular slope, whose breadth is 5 yards 1 foot; and the diameter of the upper circular edge is 17 yards 1 foot 9 inches. What quantity of earth has been excavated?

SECTION III.

1. Describe Gunter's chain, point out its peculiar advantages, and explain how it is used in the field.
2. What instruments are required, and what observations to be made, in order to determine the difference of level between two distant parts of a town?

ALGEBRA.

SECTION I.

1. Show that if $b - c$ be subtracted from a , the result is $a - b + c$.

2. Prove the rules for determining the sign of the product, when two quantities are multiplied together; and explain the meaning of the expressions a^0 , a^{-m} .

SECTION II.

1. Multiply $2a - 3b$ by $2a + 3b$, and $9x^2 - 6x + 4$ by $\frac{x}{3} - \frac{1}{2}$.

Also calculate the value of $2a - 3b + \sqrt{a^2 - b^2}$, when $a = 6$ and $b = 3$.

2. Divide $4a^3 - ab^2 - 12b^3$ by $2a - 3b$, and $\frac{3}{4}(4a^2 - 9b^2)$ by $\frac{9}{16} \frac{(2a - 3b)^2}{2a + 3b}$.

3. Reduce $\frac{2}{x-1} - \frac{3}{x+1} \frac{5x-1}{x^2-1}$, and $(-a)^m + (-b)^n$ respectively to their simplest forms.

4. Reduce $\frac{4a^3 - 12a^2b + 17ab^2 - 12b^3}{6a^2 - 5a^2b + 6ab^2 + 8b^3}$ to its lowest terms, and

$\frac{a+b\sqrt{-1}}{a-b\sqrt{-1}} - \frac{a-b\sqrt{-2}}{a+b\sqrt{-1}}$ to its simplest form.

Show also that $a^m \times a^n = a^{m+n}$, for all values of m and n .

SECTION III.

1. Find the value of x in the equation.

$$\frac{2(2x-5)}{3} = \frac{3x-2}{4} + \frac{x-6}{6}$$

Find also two numbers whose sum is 100 and their difference 36.

2. At what time, between 10 and 11 o'clock, will the hour and minute hands of a watch first include between them a portion of the circle, on which the minutes are marked, just equal to 6 of the minute divisions?

Solve the equations (1) $ax + \sqrt{ax^2 - bx + c} = f$;
 (2) $acx^2 + bcx = abx + b^2$.

3. Solve the equations
$$\left. \begin{aligned} x + y &= 29 \\ \sqrt{x} + \sqrt{y} &= 7 \end{aligned} \right\}.$$

There are 20 boys in a class, each of whom is to have a copy of the same book. Some of the books are to be bound, and the rest unbound; and the binding of each volume will cost 1s. 6d. It is determined to spend £1 16s. on each set. Of how many books will the bound set consist, and what will be the cost of a bound volume?

SECTION IV.

1. Show that if $a : b :: c : d$, then $ad = bc$; and illustrate the result by a geometrical example.
2. If $a : b :: c : d :: e : f$; then

$$\begin{array}{ccc} a & : & b \\ & :: & \\ a + c & : & b + d, \end{array}$$
 and
$$\begin{array}{ccc} & & \\ & :: & \\ a + c + e & : & b + d + f \end{array}$$
3. Explain the meaning of the terms "*Arithmetical mean*," and "*Geometrical mean*;" Find the Arithmetical and Geometrical means between a and b , and show that the latter can never be greater than the former. Illustrate the results geometrically.
4. If $A \propto B$ when C is given; and $A \propto C$ when B is given: then, when B and C both vary, $A \propto B \times C$. Illustrate the proposition by reference to a body moving uniformly with differing velocities and during different times.

SECTION V.

1. Find the discount upon a given sum, which is due at a given period.

What party gains by the usual way of reckoning interest for the given time, instead of the correct discount?

2. Find the amount of a given sum for a given number of years at compound interest.

A merchant borrows $\text{£}P$ for n years at r per cent. interest, and by trading makes it produce $r + s$ per cent. What will be the amount of his gain upon this money, accumulated at the end of n years?

GEOMETRY.

SECTION I.

1. Define a circle, a triangle, an isosceles triangle, and an equilateral triangle. Prove that the angles, which one straight line makes with another upon one side of it, are either two right angles, or are together equal to two right angles.
2. The angles at the base of an isosceles triangle are equal to each other.
3. Define parallel straight lines. State the axiom which you assume respecting such lines; and explain where, and for what purpose, that axiom is introduced in the theory of parallels. State also the corresponding axiom in any other true theory of parallels with which you may be acquainted; and point out the equivalence of the two assumptions.

SECTION II.

1. Make a triangle of which the sides shall be equal to

three given straight lines. State the condition which must be fulfilled by these given lines ; and point out how the construction fails when that condition is not fulfilled.

2. Prove that parallelograms upon the same base and between the same parallels are equal to one another.

Show hence that the area of a parallelogram is properly measured by the product of the numbers that represent its base and its height.

SECTION III.

1. Show how to find the centre of a given circle, and prove that the point found is the centre.
State the most convenient way of finding the centre of a circle traced out on a plane surface.
2. The straight line drawn at right angles to the diameter of a circle, from the extremity of it, falls without the circle ; and no straight line can be drawn from the extremity, between that straight line and the circumference, so as not to cut the circle.
3. Show that if two straight lines cut one another within a circle, the rectangle contained by the segments of one of them is equal to the rectangle contained by the segments of the other.

From this proposition deduce the equation to the circle referred to rectangular co-ordinates.

SECTION IV.

1. The areas of triangles and parallelograms of the same altitude are to one another as their bases.
2. Show that the areas of similar triangles are to one another in the duplicate ratio (or as the squares) of their homologous (or corresponding) sides.

A portion of a triangle, next to one angle, is cut off by a line parallel to the opposite side, and cutting off one-third of each of the other sides. What portion of the area of the whole triangle is cut off?

3. Prove that the areas of equiangular parallelograms are to each other as the product of their sides. If the sides about the equal angles be proportionals, what will be the ratio of the parallelograms to each other?
-

MECHANICS.

SECTION I.

1. A labourer working with a wheel and axle 8 hours a-day can yield at the rate of 3600 units of work per minute. How much must he charge per ton for raising coals from a depth of 25 fathoms, in order that he may earn 2s. 6d. per day?
2. An engine of 5-horse power raises 30 cwt. of coals per hour from a pit whose depth is 240 fathoms, and at the same time gives motion to a forge hammer which makes 25 lifts per minute, each lift being 3 feet; it is required to determine the weight of the hammer.
3. Two men undertake to dig a drain 500 feet long, and to carry the materials in barrows to a heap at the end of it. Into what two parts must they divide the work, so that one-half of the labour may fall to the share of each?

SECTION II.

1. How many cubic feet of water must descend a river every minute to drive a wheel of 4 effective horse

power, by means of a fall of 16 feet, the wheel yielding .68 of the work of the fall.

2. How would you calculate the velocity with which a ball leaves the muzzle of an air-gun, knowing the dimensions of the condensing chamber and barrel, the pressure of the condensed air, and the weight of the ball?
3. A square reservoir is to be dug capable of containing 62,500 cubic feet of water. The material is to be carried an average distance of 10 feet from the edge of the reservoir. What must be its dimensions that the work of raising and transporting the material may be *minimum*?

SECTION III.

1. Two cords, one 8 feet, and the other 10 feet long, are attached to a weight of 100 lbs. and fastened at their other extremities to two points in the ceiling 12 feet apart. What is the strain on each cord?
2. A barge, 40 feet long and 10 feet wide, is to be constructed with sheet-iron, each square foot of which weighs 20 lbs. What must be its depth that it may just carry 60 tons lading?
3. A train, weighing gross 80 tons, is allowed to descend freely an incline of 100 to 1, 500 yards in length. How far will it run along the horizontal line at the bottom of this incline with its acquired velocity, resistance being assumed throughout to be 8 lbs. per ton?
4. The wall of a reservoir is 15 feet high, and of the uniform thickness of 3 feet, each cubic foot of the material weighing 120 lbs. Shores (props) are placed to support it 10 feet apart; each shore is 15 feet long, and its foot rests at a point 8 feet from the base of the wall. What is the thrust on each shore when the reservoir is full?

TRIGONOMETRY.

SECTION I.

1. Trace the sign of the tangent of an arc through the four quadrants.
2. Show that $\cot A = \frac{\cos A}{\sin A}$.
3. $\operatorname{Cosec} (2n + \frac{1}{2})\pi = 1$.
4. $\cot^2 A - \cos^2 A = \cot^2 A \cos^2 A$.
5. $\sec \left(\frac{\pi}{4} + A \right) \sec \left(\frac{\pi}{4} - A \right) = 2 \sec 2A$.

SECTION II.

1. Show that $\cos (A + B) = \cos A \cos B - \sin A \sin B$.
2. $\tan \left(\frac{\pi}{4} + A \right) - \tan \left(\frac{\pi}{4} - A \right) = 2 \tan 2A$.
3. $1 + \sin 2A = (\cos A + \sin A)^2$.
4. $\sin^{-1} \frac{3}{5} + \sin^{-1} \frac{4}{5} = \frac{\pi}{2}$.

SECTION III.

1. Show that in any plane triangle $\frac{a}{b} = \frac{\sin A}{\sin B}$.
2. $\cos A = \frac{b^2 + c^2 - a^2}{2bc}$.
3. I wish to determine the distance from one another of two inaccessible objects, C and D, by observations made at stations A and B, from which C and D are visible. How must I proceed, the distance from A to B being supposed to be known?

SECTION IV.

Work the following problems by construction:—

1. I observe that the angular elevation of the summit of a mountain situated on a horizontal plane is 30° , and approaching 500 yards, I find that it has become $40^\circ 15'$. What is the height of the mountain?
2. Wishing to determine the distance of a station, C, from two others, A and B, 300 yards apart, I walk from A towards B 100 yards, and then turning round, I walk in a direction inclined at 45° to the path over which I have before walked 500 yards, A and C then appear to me in the same straight line. Turning round again, and walking in a direction inclined at 45° to my last path, I find that after I have walked 800 yards, B and C appear in the same straight line. How far is C from A and from B?
3. There are three stations, A, B, C, on the same horizontal plane; the distance from A to B is 700 yards, from B to C 300 yards, and from C to A 600 yards. From a point whose position I wished to determine, with reference to these stations, I observe that A and B make an angle of 49° , and B and C an angle of 22° . What is the distance of this point from each station?

SECTION V.

Show that

1. $\log M N = \log M + \log N$.
2. Show that in any spherical triangle $\cos a = \cos b \cos c + \sin b \sin c \cos A$.
3. Determine $\sin A$ from the above formula, under a form adapted to logarithmic calculation.

DIFFERENTIAL AND INTEGRAL CALCULUS.

SECTION I.

1. Define a differential co-efficient, and a second differential co-efficient. Find the first and second differential co-efficient of $\frac{a^2 - x^2}{x}$
2. Write down Taylor's Theorem; deduce Maclaurin's from it; and apply the latter to the expansion of a^x in a series proceeding by powers of x .
3. Apply Taylor's Theorem to the expansion of $\sqrt{a^2 - (x + h)^2}$ in a series proceeding by powers of h . Explain the result when x is made equal to a ; and show that the Theorem is not untrue in that case.

SECTION II.

1. Show that the value of x , which make $f(x)$ a maximum, render $\frac{df(x)}{dx} = 0$. Find the least value of $\frac{a^2 + 4x^2}{x}$.
2. State the conditions for determining the maximum and minimum values of functions of one variable; and determine the greatest rectangular beam that can be cut from a given cylindrical piece of timber.
3. Write down the equation to the tangent at any point of the curve whose equation is $y^2 = ax - mx^2$; and show what it becomes when that point is the origin of co-ordinates; and also when it is in the axis of x , at a distance $\frac{a}{2m}$ from the origin. Find the greatest value of y ; and trace the curve.

SECTION III.

1. Integrate the differential co-efficients $\frac{x}{\sqrt{a^2 - x^2}}$ and $\frac{x^2}{a - x}$, taking the latter one between the limit $x = 0$ and $x = \frac{a}{2}$.
 2. Write down the expression for finding the volume of a solid of revolution; explain its meaning in the theory of infinitesimals; and apply it to show that the volume of a right cone is found by multiplying the area of the base by one third of the height. Show that the volume of any pyramid is found by the same rule.
 3. Prove the expression for the differential co-efficient of a surface of revolution; and show that if a cylinder circumscribe a sphere, then two planes, each of which is perpendicular to the axis of the cylinder, include between them equal surfaces of the sphere and cylinder respectively.
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ASTRONOMY.

SECTION I.

1. Explain the phenomena of the Seasons.
2. What principal changes would appear in the heavens to a person who watched them at the same place night after night for a year?
3. In what respects does the inclination of the earth's axis tend to a more equal distribution of temperature than would otherwise be produced?

SECTION II.

1. How is it known that the planets are not always at the same distance from us ?
2. Why do not eclipses occur every month ? When does an *annular* eclipse of the sun take place ?
3. How often would the same eclipses return if the line of the moon's nodes remained always parallel to itself ? Why do they return every 19 years ?

SECTION III.

1. How may the latitude of a place be determined by observing the meridian altitude of the sun ? What corrections must be applied to the observed to obtain the true altitude of the sun ?
 2. How is the mean time determined from the hour-angle of the sun ?
 3. What are Kepler's Laws.
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GEOGRAPHY.

SECTION I.

1. Draw a map of Battersea, representing its streets, roads, principal buildings, and manufactories.
2. Draw a map of England, representing its coal-fields and chief manufacturing towns. Add any other particulars of its geological formation with which you are acquainted.
3. Give a description of one of the following towns :—Durham, York, Canterbury, Portsmouth.
4. Which are the most perfect remains of feudal fortresses in England ? and where are the following noblemen's seats :—Eaton Hall, Chatsworth, Blenheim ? In what respect do the landscapes of England differ from those of most foreign countries ?

5. Mention four of the principal manufacturing products of England, and state, in respect to one of them, whence the raw material is obtained, where and how manufactured, and to what annual amount.

SECTION II.

1. Where are the following places severally situated, and for what celebrated :—Hamburg, Munich, Avignon, Barcelona ?
2. Where are the following countries :—Dalmatia, Bokhara, Ecuador ?
3. Describe the mountain and river systems of Spain ?
4. Draw a map of the United States of America, showing the relative position of the States, and the principal commercial and manufacturing towns.
5. Describe, generally, the industrial pursuits of the inhabitants of Europe, whether pastoral, agricultural, or manufacturing, with reference to the character of the soil, its surface, level, and the mineral productions of each region.

SECTION III.

1. What are the causes tending to disturb the astronomical distribution of temperature on the earth's surface ? Describe particularly the influence of radiation.
2. What natural shelter is provided for vegetation from extreme cold and from excessive heat ? Give examples of this shelter. Why is the deposition of dew dependent on the clearness of the sky ?
3. What winds prevail *without*, and what *within*, the tropics ; and why ? In what general direction would a vessel be steered from hence to the Antipodes and back ? Why are the western sea-boards

of the great continents warmer than their eastern sea-boards?

4. Account for the tides, and for the return of high-water, at different times twice every twenty-four hours.
5. Account for the cold of elevated regions, and give examples of a variety of climates assembled over nearly the same spot of the earth's surface, and of the influence of that variety on vegetation.

SECTION IV.

1. What is the length, the average breadth, and the area of the Holy Land, and with what European countries may it compare in extent?
2. What are the rivers and brooks of Palestine mentioned in Scripture?
3. What were the divisions of the Holy Land in the time of our Saviour? What were the countries then known as Idumea, Perea, and Coele Syria.
4. Draw a map of Jerusalem and its environs, marking upon it the holy places.

ENGLISH LANGUAGE AND LITERATURE.

SECTION I.

1. Distinguish between a consonant and a vowel; describe the characteristic differences in the mode of uttering d, t, and s; and give instances of the different sounds of a.
2. Mention all the different sounds in the English language.
What is the rule for doubling the final consonant before an affix (*ex. gr.* in such cases as, admit, admitted)?

3. Mention all the different vowel-sounds in the English language. Are the various sounds expressed by *ch*, *i*, *j*, *th*, and *z*, severally simple and single, or otherwise? With regard to the sounds represented by *th*, how were they expressed in the Anglo-Saxon language? and how is the introduction of our practice accounted for?

SECTION II.

1. What are the meanings of the following terms:—pronoun, adverb, case, tense? and what do they designate in grammar? Write down the past tenses and perfect participles of the following verbs:—ring, swim, bear, work.
2. Point out what is defined respecting the action by the following expressions:—I did say; I shall have said; I shall have been saying; I shall be saying; I might have been saying. State the derivation and uses of the words—might, should, ought.
3. What are the different forms of the first person of the present tense in the indicative mood? and for what different purposes are these forms severally employed?

SECTION III.

1. Hope springs eternal in the human breast:
Man never is, but *always* to be blest:
The soul, *uneasy*, and *confined* from home,
Rests and *expatiates* in a life to come.
- (1) Parse the two first lines.
- (2) Point out the words that have an Anglo-Saxon, and those that have a Latin origin; also analyse, etymologically, those printed in italics.
- (3) Describe the structure of the versification; and point out any irregularities that occur.
- (4) Paraphrase the passage.

SECTION IV.

1. Mention the times at which the following authors respectively wrote: — Spenser, Milton, Pope, Hume, Cowper. Name a principal work of each. Mention some of Pope's contemporaries.
 2. At what time did Chaucer live? What is his chief work called? and why so called? Who were the foreign writers of his own time, or nearly so, by whose productions he was influenced?
State the nature of Lord Bacon's writings, and their influence.
Sketch, briefly, the chief excellences and defects in the writings of Scott and Wordsworth.
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AGRICULTURAL CHEMISTRY.

SECTION I.

Explain the structure and functions—

1. Of the roots of plants.
2. Of their stems.
3. Of their leaves.
4. How may the starch and gluten of grain be separated? What functions do they perform in the first growth of the plant?
5. What functions are assigned to *diastase* and *dextrine* in the growth of plants, and whence are these substances derived? Why is barley made to sprout in malting?
6. Give some account of the soluble portion of the inorganic parts of plants.

SECTION II.

In what districts do the following geological formations prevail, and what are their agricultural characteristics :—

1. The tertiary strata ?
 2. The lower oolite ?
 3. The new red sandstone ?
 4. What general conclusions have been deduced from the analysis of soils ?
 5. What are the properties of the nitrogen in manures, and by what manures is it supplied in the greatest abundance ?
 6. Give some account of the different kinds of artificial manure, and of their properties.
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ENGLISH HISTORY,

FROM THE REIGN OF HENRY VIII. TO THAT OF
GEORGE III.

SECTION I.

- 1- Who were the sovereigns of the house of Tudor ?
Under what circumstances did that family succeed to the throne ?
2. What principal steps in the Reformation were taken in the reign of Henry VIII., who chiefly promoted, and who opposed them ?
3. What were the principal events on the continent of Europe during the reign of Henry VIII., and who were the contemporary sovereigns ?
4. Enumerate in the order of their occurrence the principal events of the reign of Elizabeth. Who were the most eminent prelates of that time, and who were her chief advisers in state affairs ?
5. What principal events occurred on the Continent

during the reign of Queen Elizabeth? Who were the contemporary sovereigns?

6. How do you account for that ascendancy of the regal power in the British constitution which is apparent in the reigns of Henry VIII. and Elizabeth, as compared with earlier and later periods in our history?

SECTION II.

1. What were the grounds on which the House of Commons placed itself in opposition to the Crown in the commencement of the reign of Charles I.? Who were his principal advisers during his reign, and his chief opponents?
2. What part did the Scots take in the great rebellion?
3. Give some account of the reign of William and Mary.
4. What was the title of George I. to the throne of England, by descent? Under what authority did he reign? What was the claim of the house of Savoy?
5. By what public acts was the British constitution established or confirmed in the reigns of William and Mary, Queen Ann, and George I.?

SECTION III.

Give some account of the British constitution as it now exists.

HISTORY OF THE CHURCH.

SECTION I.

1. Give an account of the first preaching of the gospel to Gentiles; also of the dissensions at Antioch respecting the Gentile converts, and of their settlement. Define the dates of these events as nearly as you can.

2. Give an account of St. Paul's lengthened stay at Ephesus, and explain the peculiarities of the events that took place there.
3. Sketch the history of the controversy respecting the obligation of Christians to observe the law of Moses, as far as the New Testament gives information respecting it.

SECTION II.

1. Give some account of Polycarp and Irenæus. Describe the change in the state of the Church under the Emperor Constantine.
2. Sketch the history of the controversy respecting the celebration of Easter.
3. What was the nature of the Gnostic notions with respect to our Saviour? Give a brief account of the Christian school at Alexandria during the latter part of the second century, and the earlier part of the third; and particularly of its teachers, Clement and Origen.

SECTION III.

1. Give some account of the following Archbishops of Canterbury—Augustine, Theodore, Dunstan, Thomas à Becket.
2. Show that the Christian Church in Britain was originally independent of Rome, and trace the steps of its subjection to the Papacy.

SECTION IV.

1. Give some account of the following men—Wickliffe, Luther, Cranmer.
2. Sketch the history of the opposition made in England to Romish doctrine, from Wickliffe to the Reformation. Describe the state of the English Church at the death of Henry VIII.

SECTION V.

1. At what time was our book of Common Prayer first settled in nearly its present shape? When was the last revision of it? When were the versions of the Psalms, contained in the Bible and the Prayer Book, respectively made? State, in the language of the Liturgy and Articles, the doctrine of our Church concerning Baptism.
 2. What Service-book was generally used in England before the Reformation? What was its origin? From what sources was our book of Common Prayer compiled? What was the nature of the discussions respecting it at the Restoration? In what did they result? Show from the formularies in what sense absolution by the priest is recognised by our Church.
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SCRIPTURAL KNOWLEDGE.

THE BOOK OF EXODUS, THE FOUR GOSPELS, THE FIRST
EPISTLE TO THE CORINTHIANS.

SECTION I.

1. "The Old Testament." "The New Testament."
In what sense are these terms applicable to the Holy Scriptures?
2. What threefold division did the Jews make of the Old Testament? In what words was this division recognised by our Saviour? What books were included under each division?
3. Give the history of the translation of the Holy Scriptures into the English tongue.
4. What is the history of the division of the Scriptures into chapters and verses?

5. What is the history of the books known as the Septuagint and the Vulgate?

SECTION II.

1. What miracles are related in the book of Exodus?
2. "And Jethro, Moses' father-in-law, came with his sons and his wife unto Moses in the wilderness, where he encamped at the Mount of God." Exodus xviii. 5. What was the advice given by Moses to Jethro on this occasion?
3. Describe the feast of the Passover; show, by passages from the New Testament, its typical character.
4. Give an example of "the feast upon a sacrifice," and show its covenant character.

SECTION III.

1. Relate the miracle of the healing of the centurion's servant, with a careful attention to all the circumstances. By what Evangelists is this miracle recorded?
2. Describe, in the words of Scripture, our Saviour's washing of the feet of his disciples.
3. "And there were certain Greeks among them that came up to worship at the feast; the same came therefore to Philip which was of Bethsaida of Galilee, and desired him, saying, Sir, we would see Jesus." John xii. 20. Continue the narrative.
4. Give some account of the life of St. John. What principal events recorded by other of the Evangelists are omitted in his gospel?

SECTION IV.

1. Describe the site of Corinth, the character of its ancient inhabitants, their commerce and their religion; and explain in its application to the people

- of this place the passage, "*Know ye not that they which run in a race run all, but one receiveth the prize,*" &c. 1 Cor. ix. 24.
2. What were the circumstances under which the church was first established at Corinth?
 3. Show, from the First Epistle to the Corinthians, the typical character of the manna in the wilderness and of the rock in Horeb.
 4. "Know ye not that ye are the temple of God, and that the Spirit of God dwelleth in you?" 1 Cor. iii. 16. On what other occasions has St. Paul used this metaphors?
 5. "For by one spirit we are all baptized into one body;" "and whether one member suffer, all the members suffer with it; or one member be honoured, all the members rejoice with it." 1 Cor. xii. 13, 26. Explain this passage, and apply it.
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METHOD, CATECHISM, &c.

N.B. The first two Questions to be answered by masters only.

1. Describe your own school.
2. What course of private study have you pursued since you entered upon the office of schoolmaster?
3. Write out the heads of an examination, founded upon the 1st, 2nd, 3rd, and 4th verses of the 21st chapter of St. Luke's Gospel, to a class in your school.
4. Explain the following question in the Catechism, and the answer to it.
 "Why then are infants baptised, when, by reason of their tender age, they cannot perform them?"
5. On what authority is the sacrament of Baptism administered to infants?

APPENDIX II.

ANSWERS TO THE QUESTIONS IN PAPER XIV., APPENDIX I.

[Solutions were framed to the greater part of the Questions in the preceding Appendix, with a view of publishing them; but their insertion would so materially increase the size of this volume, that the compilers resolved to publish the Questions only. Scripture Knowledge, however, is of so varied a nature, and of such paramount importance to the Elementary Teacher, that it is believed the matter in this Appendix will not be destitute of interest and value.]

SCRIPTURAL KNOWLEDGE.

THE BOOK OF EXODUS, THE FOUR GOSPELS, THE FIRST
EPISTLE TO THE CORINTHIANS.

SECTION I.

1. The word *Testament*, as applied to the Holy Scripture, appears to have originated with the Vulgate translation, from its author, St. Jerome, rendering the Greek word, *Diatheké*, *Testamentum*. Although Testament or *will* allows of a beautiful construction, when applied to that part of Holy Writ which dates after the Advent; yet when the word *New* is used, the suggestive nature of the term is such, in connection with will, that we intuitively seek for a former will; but in that, since no contracting party died, the subject becomes obscured. We discover the nominal antithesis in the

term Old; yet the applicability of the previously expressive rendering of the word Testament immediately vanishes, and we at once acknowledge that the usual rendering of *Diatheké*, covenant, is preferable. Mediator of the new testament (Heb. ix. 15), and Mediator of the new covenant (Heb. xii. 24), are renderings of the same Greek phrase. The great apostle, who uses the term rather in the sense of a compact than a will throughout the whole sublime comparison of the covenants, is by some supposed to have availed himself of the ambiguous import of the word; but it should rather be said that, if he employs it at all in the sense of testament in its simple meaning, it is not when comparing the covenants, but when referring to the "promise (not like the Israelites of the earthly Canaan, but) of an eternal inheritance." That the word designating the two dispensations should afterwards be applied to the writings themselves, is not at all surprising; but, that that term, in this case, should be understood to convey the idea of agreement, league, covenant, and not last will, is evident from our blessed Saviour's own words at the time of the institution of the Eucharist,—“This is my blood of the *new covenant*, which is shed for many.” (See Faber's *Dispensations*, vol. ii., and M'Bride's *Diatessaron*).

Bearing in mind the real import of the word testament, we may trace the application of the terms Old and New. These point out the two divisions of the Bible; the former indicating that portion of revelation whose existence was anterior to the Advent of our Lord, as compared with what was imparted after his coming. “The law and the prophets were until John.” Luke xvi. 16. The Old Testament, which is thus mentioned by the Evangelist, contains God's first dispensation of grace to fallen man, and is the earliest authentic source of our knowledge of God and of ourselves. It records

the preparation made for the coming of our Lord Jesus Christ, as our Saviour. Its types, ceremonies, and prophecies, after having cherished for thousands of years the expectation of the world's deliverance, gave evidence, by their fulfilment, that Jesus was the promised Deliverer. The New Testament presents to us our blessed Lord actually come; purchasing by his all-sufficient atonement our salvation; unfolding its whole plan by the outpouring of the Holy Spirit, removing the partition wall that limited the benefits of the former dispensation to a peculiar people; and making all nations eligible recipients of his great salvation. An interval of 400 years divides Malachi, the last of the writers of the Old Testament, from the time of the Evangelists.

2. The Jews divided their Scriptures into the Law, the Prophets, and the Psalms. Our Lord adopts this distinction in his last address to his apostles. See Luke xxiv. 44. The *Law* included the five books of Moses, called the Pentateuch. Sometimes the whole of the Jewish Scriptures were designated the Law; as in John x. 34. The *Prophets* included the sixteen books of prophecy and the historical writings, making thirty books of our canon of Scripture. The Hagiographa or Psalms contained the Psalms, the Proverbs, the book of Ecclesiastes, and the Song of Solomon. But this was not an invariable arrangement, some of the books of the prophets being at times reckoned with the Psalms. (See Prideaux's *Connexion*, vol. i. page 319, Tegg's edition).

3. Various parts of the Bible were translated into Saxon, when that language was spoken in England.

Adhelm, first bishop of Sherborne (A.D. 706), translated the Psalms. Egbert, bishop of Lindisfern, and contemporary with Adhelm, rendered the Gospels into Saxon. Venerable Bede, early in the eighth century,

translated some parts of the Bible into Saxon. King Alfred translated the Psalms, and Elfric, archbishop of Canterbury, other parts of the Old Testament, about A.D. 995. The first complete English Bible was Wicliffe's, about 1380. That distinguished reformer not being acquainted with the Hebrew and Greek languages, adopted the Vulgate or Latin version, as his text. This translation was very influential in bringing about the Reformation. Attempts were made in 1390 to suppress it; but the Hanneh Lollard, John of Gaunt, Duke of Lancaster, was its firm champion, and caused the failure of the bill that was to have interdicted it. But in 1408 a decree of the convocation of Oxford forbade the reading of Wicliffe's works, and the translation of any part of the Scriptures into English. We are indebted to the earnest and intrepid Tindal for the first printed edition of any part of the Scriptures in English. This was his New Testament, printed anonymously, at Antwerp or Hamburg, in 1526. Between that date and 1531, Tindal, assisted by Coverdale, translated most of the Old Testament. In the last-named year he was seized, and, after an imprisonment of five years, was condemned to death by the Emperor of Germany. The sentiments of Henry VIII. on religious matters were so far modified in the mean time, that, while he had concurred in the persecution of Tindal in 1535, he permitted the publication of Tindal's and Coverdale's Bible, and ordered a copy of it to be placed in the choir of every parish church. Another edition, with some emendations, followed in 1537. This was the work of Rogers, who suffered death at the stake in Mary's reign. It bore the fictitious signature of Thomas Matthews. Taverner's Bible followed in 1539; it was a correction of Matthews' Bible—the Great Bible—so called because printed in large folio (1539), was a revised edition of the preceding. From Cranmer's con-

nection with it in the way of revision, it sometimes bears his name. The Geneva Bible, the work of Coverdale, Knox, Goodman, and other Calvinists, was published in 1560. In Elizabeth's reign the bishops, at the head of whom was archbishop Parker, issued an edition (1568), which goes by the name of the Bishops' Bible. The present version, called King James's Bible, because brought out under the auspices of that monarch, was published in 1611. Fifty-four of the most learned men in the kingdom were engaged during three years in the preparation of this last and most complete version of the Scriptures. (See Beren's History of the Prayer Book, pp. 20—25; Nicholls' Help to Reading the Bible, page 154).

4. Our present arrangement of the books of the Bible is of comparatively recent date. But it probably had its origin in the ancient Jewish division of the law and the prophets into fifty-four sections, for convenience of reading in the synagogue. Some Jewish writers, indeed, claim the authority of Moses for such a division of their law. Others, with more reason, attribute it to the zealous reformer Ezra. The subdivisions of these sections is of about the same date, and is said to have been adopted for the convenience of the Targumists or Chaldee interpreters. But this division in no respect corresponded to that of our existing Bibles. The author of this division was Hugo de St. Caro, a Dominican monk, and afterwards a cardinal, who flourished about the year 1240, and died 1262. He was deeply read in Biblical literature, and made a comment on the Scriptures. For convenience of comparing one passage with another, he made a Concordance, the first work of the kind that had been attempted. The want of some easy mode of reference suggested the necessity of dividing each book of the Scriptures into small portions, that by these he might the better make the references,

and with more facility point out, in the index, where every word or passage might be found in the text. On the publication, or rather the dispersion of this Concordance, its utility was at once recognized, and Bibles were then divided, as in the Concordance. But the subdivision of chapters into verses, as we now have them, is of still later date. Hugo's chapters were divided into sections, by placing letters of the alphabet at regular intervals by the side of the text. Two centuries later, Rabbi Nathan, a great controversialist, conscious of the advantage possessed by his Christian opponents, in their ready finding of any passage of Scripture which they had occasion to consult, devoted seven years (1438—45) to the formation of a Concordance to the Hebrew Bible. But while the Rabbi followed Hugo's division of Scripture into chapters, he substituted figures for letters in the minor division of verses. Stevens, in 1551, issued the first New Testament with a similar arrangement to that which had long obtained in the Old.

5. The Septuagint takes its name from a fiction that flatters the national vanity of the Jews; Ptolemy Philadelphus (B.C. 277), is represented as having sent an embassy to the Jews, which he seconded with most costly means of conciliating their good will, to induce them to supply for his library at Alexandria a correct translation of their Scriptures into the Greek language. The Jews sent him seventy-two interpreters, six from each tribe, who made the required version.

The accompanying circumstances are wanting in evidence of their credibility. The interpreters were placed in separate cells, in the isle of Pharos, near Alexandria, and strict precautions adopted to prevent collusion. Each made a complete version, which was found to agree in every phrase, word, and letter, with those of the rest. The wonderful part of the story received

many accessions at the hands of various writers. Their contradictions, uncertainties, and various accounts overthrew the credit of the whole story, which indeed has no other foundation than that such a Greek version of the law was made by the Alexandrian Jews in the time of Ptolemy Philadelphus. The most ancient and best manuscript of the Septuagint version now extant, is the Alexandrian copy, presented to Charles I. by the Patriarch of Constantinople, and now in the British Museum. The Vulgate is the authorized version of the Roman Catholics. It is a Latin translation of the Septuagint; though with many gross errors. The Council of Trent (1545—1563), declared it a faithful, accurate, and perfect translation, and in effect decreed that it was beyond the reach of criticism or censure. (See *Prid. Conn.* vol. i. p. 26—57; Mosheim, *Century xvi.* part 25.

SECTION II.

1. The miracles related in the book of Exodus are—
 1st. Divine manifestation in the burning bush, which was not consumed, chap. iii. 2nd. Moses' rod turned into a serpent. 3rd. His hand made leprous and recovered, chap. iv. 4th. Moses in presence of Pharaoh causes his rod to become a serpent. 5th. Turns the water of the Nile into blood, chap. vii. 6th to 15th. The plagues, chaps. viii. to xii. 16th. The means for the guidance of the Israelites in their journies, the pillar of cloud by day, and fire by night, chap. xiii. 17th. Passage of the Red Sea. 18th. Sweetening the waters of Marah. 19th. The supply of food to the Israelites. 20th. Causing water to flow from the rock in Horeb. 21st. Convulsions of Sinai at the giving of the law, chap. xix. Several circumstances of a preternatural kind are likewise mentioned, though they are not of the class usually.

denominated miracles ; as the victory over the Amalekites, obtained by Moses' hands being sustained in a particular attitude till the going down of the sun ; the celestial brightness of Moses' face at the time of his personal communications with the Deity ; the Divine enlightenment of Bezaleel and Aholiab, when they were selected for the work of the tabernacle.

2. Jethro advised Moses to delegate to proper persons some portions of his magisterial duty ; to reserve to himself the adjudication of great causes ; but for minor matters to appoint heads or rulers over tens, hundreds, and thousands, and thus to lighten himself of part of his onerous duty.

3. The feast of the Passover was instituted in commemoration of the deliverance of the children of Israel from the bondage of Egypt. It is called the Passover because it celebrates the passing by or over the Israelites when the destroying angel executed the Divine sentence of killing all the first-born of the land of Egypt. For this feast each family of the Israelites was required to kill a lamb—a male of the first year, without spot or blemish—to sprinkle its blood on their door-posts and lintels ; and to eat its flesh with bitter herbs and unleavened bread. At the sight of the sprinkled blood the destroying angel passed by the dwelling so protected. The exact observance of this ordinance was the condition of security from a great impending judgment. The obedience and gratitude of succeeding generations were tested by an annual memorial of the sacrifice which procured God's favour for their progenitors. As an encouragement to obedience, God graciously promised that the property of those who went from distant places to their great festival should be safe from the depredation of enemies (Exodus xxxiv. 24).

The typical character of this ordinance as a foreshadowing of that greater deliverance which we were to

have by the Messias, is indicated in most direct terms by St. Paul (1 Cor. v. 7), "Christ our passover is sacrificed for us." (See also John xix. 36; 1 Peter i. 19; Rev. v. 12; 1 Cor. xv. 3, &c. &c.) Our great atonement was made—our passover was sacrificed for us in the same month and day of the month that the Israelites were delivered from the rule of their oppressors. The passage through the Red Sea and the wilderness, which immediately succeeded the first observance of the Passover, are apt emblems of our pilgrimage towards that rest which remaineth to the children of God.

4. In most of the Jewish sacrifices, a part was eaten by the persons who presented the offering, the remainder being either consumed upon the altar, or apportioned to the officiating priest. In the feast of the Passover no part of the sacrifice was offered up, the whole of the paschal lamb being eaten. The federal character of this transaction is somewhat similar to the tacit covenant subsisting between a host and his guest. By their offerings, the sacrifices acknowledged God's power, and his right to be worshipped; while, on the other hand, he in return, admitted them to his favour and protection, in sign of which they were to eat of his table and of the things sacred to himself. The sacrament of the Lord's Supper presents a striking analogy to the feast upon a sacrifice of the old dispensation.

SECTION III.

1. It is worthy of remark, that the two most eminent instances of faith which called forth the admiration of our blessed Saviour were exhibited by Gentiles; the woman of Canaan and the centurion. This Roman officer, whose heart had been warmed, and his whole demeanor influenced by the doctrine of our Lord, is, by St. Luke, said to have induced some of the influ-

ential Jews to intercede with Jesus in behalf of the centurion's servant (Luke vii. 10)—“For his master loved the nation and had built a synagogue.” St. Luke then says Jesus went with them; and when not far from the house, friends of the officer were sent imploring the Saviour not to proceed to the invalid, but merely to say the word, that the servant might be healed; for, said the centurion, I am a man under authority—under my Tribune's command—yet I am obeyed. Thou, who art not under authority, canst speak the word and the sufferer shall be healed, whether thy bodily eye witnesseth the malady or otherwise. The messengers returned to the house and found the servant whole. Jesus, in the mean time, turned to his Jewish followers and gave them a practical lesson, by expressing admiration of the faith found in one not born under the promise. Such is the substance of St. Luke's narrative. St. Matthew relates a similar occurrence. The sympathies and answers elicited, the substance of the account narrated, and the result obtained, are so similar, as given by the two Evangelists, that the generality of harmonists agree that the two descriptions refer to the same miracle. St. Matthew appears to have grasped, in his brief account, the leading features presented in the case, while St. Luke details it more minutely. The former refers to the primary agent, the centurion only; the latter to the two classes of secondary, the Jewish elders and friends of the centurion, and not to him as personally speaking to Jesus. Thus considered it is not necessary to explain away the text in either case. Nevertheless, the construction put upon the passage by many is, at least, feasible, if not probable—that the centurion sent both Jewish elders and intimate friends to the Divine Physician; and, deeply affected by the Redeemer's condescension—remembering too, perhaps, the case of the nobleman's

son, in the same town, who was cured at a distance—he left his house, met Jesus, illustrated his meaning, and proved the extent of his faith by using the simile of his own power and office. See Barnes's Notes.

2. As the question requires that the passage should be given in the words of Scripture, it will be unnecessary to do more than refer to the affecting and instructive narrative as related by the beloved disciple in the first seventeen verses of the thirteenth chapter of his gospel. It may be remarked, that the word "ended," used in the second verse, should have been translated *ready*. St. Luke does not mention the washing the disciple's feet, not being an eye witness; he does, however, relate the dispute amongst themselves, which probably led their Master to give them this practical lesson of humility and charity (Luke xxii. 24—27). Another instance of St. Matthew's laconism is, he passed over this event unnoticed. See Bishop Hall's Comments on this passage.

3. "Philip cometh and telleth Andrew; and, again, Andrew and Philip tell Jesus," et. seq. It appears, from the nature of the discourse at the end of the chapter, that the Greeks were present, and consequently heard the answer that was given in reference to the inquiry. See Barnes's Notes.

4. The general silence maintained in reference to the lives of the apostles before they were called to follow their Divine Master, is as applicable to the *beloved disciple* as to the others. While mending his father's nets, in company with his brother James, on the shores of the Sea of Galilee, a voice, perhaps not wholly unfamiliar to the brothers' ears, reached them; at least, they answered its commands with a promptitude calculated to strengthen the idea of a previous knowledge. They left their father, Zebedee, in the boat, forsook all, and followed the Saviour. John appears to have been

the youngest of the favoured few chosen to be the immediate and constant attendants and witnesses of the vicissitudes through which the Redeemer passed : he is said to have been about twenty-six when called upon to undergo the mental discipline that would enable him to look calmly upon the almost-martyrdom of suffering in store for him. He thus, likewise, to follow him who had not where to lay his head, left a home considerably removed from the lowest state of poverty ; for St. Mark says the hired servants were left with Zebedee in the boat : a home, too, not unblessed with a mother's parental tenderness. Salome is afterwards an attendant of her sons, as recorded by the same Evangelist, ministering to the limited wants of their Master and themselves. John, as well as his eleven companions, was speedily required to commence the work for which they were destined. He and his brother were surnamed Boanerges, sons of thunder, by which term was prophetically declared the earnestness with which they would inculcate and disseminate the doctrine of their Lord, and the effect that doctrine should have upon the astonished hearers. John was, in a high degree, the recipient of the Saviour's regard and love ; several proofs of this are recorded. He, with his brother and Peter, witnessed the exhibition of their Master's power and glory on the mount of transfiguration. They, too, were present when the departed spirit of the daughter of Jairus was recalled to its earthly tenement. They beheld his agony in the Garden of Gethsemane, when, to the dishonour of John's usually sympathetic ardour, he three times incurred the censure of his agonized Lord. How bitter must have been his feelings of self-reproach at being thus addressed—"What, could ye not watch with me one hour?" and, again, "Sleep on now and take your rest, behold the Son of Man is betrayed into

the hands of sinners." This, too, immediately after leaving the spot at which he had reclined upon the Saviour's bosom, and merited, in common with his fellow disciples, the testimony of Matthew when the disclosure was made—"One of you shall betray me;" "and they were exceeding sorrowful." John was probably the only disciple who had the fortitude to witness the last agonies of his Divine Master, and the indignities then heaped upon him. Here he was fully rewarded for his exhibition of devoted regard, by the words from his beloved Lord, "Son, behold thy mother; woman, behold thy son!" After the resurrection was discovered by the female attendants of the Saviour, John was the first who ran to the sepulchre, and believed in the Saviour's resurrection. But it was after the ascension that this apostle's character shone with the greatest splendour. Amidst the most formidable dangers, he vigourously and boldly pursued his mission. Thus he is found, on the Day of Pentecost, foremost at the ingathering of the first noble harvest of the Christian church. He was Peter's companion in labour and persecution. They beheld, when going up to the temple, the helpless petitioner for public charity; and, by the benevolent interposition of their miraculous power, they, in the name of their Lord and Master, conferred on the impotent man the use of his previously powerless limbs. They were fellow-prisoners; they undauntedly withstood the threatenings of the council, resolving "to obey God rather than man;" and although scourged and menaced, ceased not to preach Jesus. St. John, with Peter, was commissioned to confirm the converts of Samaria, where his earnestness for the spiritual welfare of the Samaritans indicated very different feelings towards them than those which actuated him when he asked the Saviour to call down fire from heaven upon some of the inhabitants of that

province. His former indiscreet zeal had elicited the wholesome rebuke, "The Son of Man is not come to destroy men's lives; but to save them." St. Paul gives testimony to the zealous support John afforded to the church at Jerusalem. He afterwards resided at Ephesus, during which period he founded several churches. He is said to have been taken to Rome during the violent persecution of Domitian. He was afterwards banished to the island of Patmos, where he was honoured with his revelation. After two years imprisonment for the word of God, and for the testimony of Jesus Christ, at the demise of Domitian, he returned to his charge at Ephesus. He lived to the age of a hundred, and is said to have been carried, when too old to walk or preach, to the public assemblies, where he would pronounce short sentences, con-juring his hearers to "live in love"—"My children, let us love one another." After undergoing every species of persecution and hardship short of martyrdom, he came to a peaceful end.

Independently of church history may be gathered, from the five books St. John wrote, that he lived both to witness the church flourish and to see many errors creep in. His books were written to oppose various dangerous errors. Thus, the doctrine of the Gnostics is ably confuted by the preface to his gospel, in which the pre-existence, divinity, and incarnation of the only-begotten Son of God are exhibited and declared. The opposite errors, which involved the denial of the atonement, was met by his first epistle—"Every spirit that confesseth not that Jesus Christ is come in the flesh, is not of God." It was not, therefore, his object to record the miracles, events, and sayings of the Saviour, as described by the other Evangelists, but such as they had omitted, and that would bear upon his subject. Thus, he omitted the birth, baptism, and temptation of

our Saviour ; many parables, discourses, and journeyings ; and the call of the apostles ; nor does he repeat any miracle related by them, except the feeding the five thousand.

Although the perusal of the following passages of his gospel will show how much he wrote that was omitted by the other evangelists, whose writings he doubtless had access to ; yet he himself declares, "There are many other things which Jesus did :"—i. 1—18 ; 19—52 ; ii. 1—12 ; 13—25 ; iii. 1—21 ; iv. 3—42 ; 46—54 ; v. ; vi. 22—71 ; vii. ; viii. 1—11 ; 12—59 ; ix. ; x. 1—22 ; 22—42 ; xi. 1—47 ; xiv. ; xv. ; xvi. ; xvii. See Nicholls' *Help*, and *Christian Knowledge Society's Commentary*.

SECTION IV.

1. Corinth, the capital of Achaia, in the time of the apostles, was situated on the isthmus to which it gives name. It occupied a central position on almost the narrowest part of the isthmus, and thus became an entrepot for the carrying trade between the Egean on the east, and the Ionian Sea on the west. The city had two outlying harbours, Lechæum, on the Gulf of Corinth (now Gulf of Lepanto), on the west ; and Cenchrea, or the Gulf of Saron, on the east. It stood on the north side of a precipitous elevation, whose summit was the site of some military defences, and from which the northern view included Parnassus and Helicon. The natural advantages of its position were early turned to account, and it became a mart where oriental productions were exchanged for the merchandise of Italy, Sicily, and other western nations. Commerce brought wealth and luxury, and to these were soon allied effeminacy and all the accompanying vices of a gross polytheism. In the neighbourhood of the city the Isthmian Games were celebrated and brought

their addition to its gaiety, dissipation, luxury, and dissoluteness. The principal deity of Corinth was Venus; unbounded licentiousness and lascivious spectacles were prominent characteristics of the honours paid her. The most depraved cities of modern times afford no parallel to the legally patronised prostitution, from which was derived a copious revenue by the civic authorities of Corinth.

1 Cor. ix. 24, and succeeding verses, must have been a most apt and forcible illustration to the Corinthian converts, as the exercises of running and wrestling alluded to in the passage, were leading ideas, supplied from the local circumstances of their city—the theatre of the Isthmian games. They were familiar with the emulative enthusiasm that inspired the *athletæ*, to the most arduous struggles for mastery, the reward of which was honorary, but unsubstantial and perishable. Prompted by infinitely higher hopes, and an unquestionable assurance of success, the apostle records his purposes and aspirations in the heavenly race and wrestling in which he was engaged; urges his converts to the adoption of the same course of conduct, and to a participation in those high hopes which sustained him under greater self-mortification than was practised by candidates for victory in the games.

2. The Christian religion was first made publicly known at Corinth, by St. Paul, about the year 51. His labours in this city of profligacy, superstition, and luxury, during a stay of a year and a half, are related in Acts xviii. Upon his arrival, he became acquainted with a Jew named Aquila, a refugee from Rome, whence he had been expelled by the order of Claudius. He, with Priscilla, his wife, became devout Christians; they left Corinth with Paul, and ultimately returned to Rome (Romans xvi. 3, 4). The friendship which sprung up between the apostle and Aquila was strength-

ened by the constant intercourse their common occupation afforded. They abode together, and wrought at their business—tent-making. St. Paul, during this residence entered the synagogue, as was his custom (Acts xvii. 2) every Sabbath, persuading the Jews and the Greeks. His efforts to convince the former that Jesus was Christ, met with the usual discouraging scepticism and hostility that ever characterised Jewish exclusiveness. There were some distinguished exceptions, Crispus, the chief ruler of the synagogue, with his whole house, believed on the Lord. The inveterate dislike manifested by the Jews, both at home and abroad, towards every infringement upon their ancient mode of worship, here developed itself to such an extent in their misguided zeal, that in their opposition they used blasphemous language against that God whom they blindly imagined they were serving. This, as in a parallel case on a former occasion, called forth the deserved indignation of St Paul (Acts xiii. 46), "Your blood be upon your own heads; I am clean, henceforth I go to the Gentiles." Opposition, both from bigoted Jews and licentious Greeks, ceased not to obstruct the progress of the gospel; yet the success of the church was most marked. St. Paul was supported against every obstacle by the assurance from God in a vision, that he who called him would be with him, so that man could not hurt him. Thus it was that Gallio, who "cared for none of these things," drove the Jews from his presence before hearing a word from Paul in answer to their accusations. Soon after St. Paul's departure, schisms, divisions, and great disorders were introduced by false teachers, against which chiefly the apostle wrote his two Epistles to the Corinthians. (See Christian Knowledge Society Commentary, Barnes' Notes on Acts, and Nicholls.)

3. "All our fathers did eat the same spiritual meat; and did all drink the same spiritual drink; for they

drank of that spiritual Rock that followed them ; and that Rock was Christ " (1 Cor. x. 3, 4). The Israelites were on their journey from a state of bondage to a land of freedom, from a land of superstition and idolatry to one in which they would hold holy communion with their King and Deliverer. But ere they entered that land of rest, they were proved by the space of forty years, and their bodies sustained by manna, food from heaven ; their thirst allayed by the stream that followed them ; those that were worthy gained admission to the earthly Canaan, after being strengthened by manna and by water from the Rock. So Jesus, our heavenly manna, and our water of life, affords nourishment to our souls while we are passing through this wilderness of probation to the heavenly Canaan. Nor must it be supposed that all who eat of this manna and drink of this Rock will, except through His further mercy, enter that haven of everlasting rest ; many never saw the Promised Land, who ate of the manna and drank from the Rock. Those who have partaken of the bread indeed, and the drink indeed, must take heed lest they themselves be cast away.

4. Twice in this Epistle to the Corinthians St. Paul employs this metaphor. In the text it is used as an argument against dissension, and the following of different leaders who had assumed the office of preacher since the apostle's departure. He exhorted them to unity, and reproved them for their divisions ; for he that planteth and he that watereth are nothing ; but God that giveth the increase is all in all. It is worthy of note that the three persons of the Godhead are in this chapter directly mentioned : " Ye are God's husbandry, ye are God's building " (verse 9) ; " Other foundation can no man lay than that is laid, which is Jesus Christ," (verse 11). And in the text, " The Holy Ghost dwelleth in you." The recurrence of the passage in:

the same Epistle is for a different object: many of the sinful practices that were sanctioned by the Corinthian laws, accorded with the corrupt passions of the age; and the new converts sought to incorporate them with Christian ordinances. Against this St. Paul protested; for they must be pure; for, said he, "Know ye not that your body is the temple of the Holy Ghost which is in you, which ye have of God?" (vi. 19). The apostle had occasion to use the same impressive metaphor when writing his second Epistle to the same Church. In the most affectionate manner, as a parent to his children, did he exhort them to have no fellowship with the unbelievers: "What ageement hath the temple of God with idols? for ye are the temple of God, as God hath said, I will dwell in them and walk in them" (2 Cor. vi. 16.) To the Church at Ephesus St. Paul wrote rather in a spirit of commendation than of rebuke; he recalled to mind what the Ephesians were when alien Gentiles, before they experienced the grace of God; and contrasted their former condition with that of being made fellow-citizens with the saints, being "builded together for an habitation for God through the Spirit" (Eph. ii. 22). Lastly, this metaphor is used in writing to the Hebrews, when comparing the brighter glory that is due to Jesus, the antitype to that of Moses, the type: "Moses verily was faithful in all his house, as a servant, for a testimony of those things which were to be spoken after; but Christ as a Son over his own house, whose house are we" (Heb. iii. 6). (See Barnes' Notes and Christian Knowledge Society Commentary.)

5. We entered into participation of the privilege declared in the first clause of the 13th verse when, conformably to the ordinance of our Saviour, we were admitted by baptism into membership with that mystical body, the Church, of which Christ is the head. Our Lord has on more than one occasion asserted the close

connection that must subsist between the true believers and the author of their faith. Nor are we to imagine that the mere outward part of the ceremony will constitute us "baptized into one body by one spirit;" our Lord emphatically declared to his own chosen few, "Ye are my disciples, if ye keep my commandments." If we aim to be recipients of the benefits of membership with the Church, we must not rely upon the mere sign of enrolment into its body; a strict compliance with the spirit of the ceremony is absolutely necessary; we must redeem the threefold promise made by our sureties on our behalf. This requisite fulfilled, through the grace of God, we may be assured that our connection with the Church and its head is as intimate as that of the member or limb with the body and its head. "No man ever hated his own flesh, but nourisheth and cherisheth it, even as the Lord the Church; for we are members of his body, of his flesh, and of his bones (chap. v. 29, 30). To assure his true followers of the heavenly assistance they should have, our Lord declared, "I am the vine, and ye are the branches. He that abideth in me and I in him, the same bringeth forth much fruit; for without me ye can do nothing" (John xv). As, then, there is this vital sympathy between the members of the Church and its head, so, when the chord of that sympathy is broken by the misdemeanor and dishonour of one member, will the effects be felt through the whole body, as when one part of our body receives injury, the others sympathise and bear their part in the affliction. St. Paul, in writing to the Corinthians, showed them that they were also parts of that mystical body, all were brought within the pale of redemption; and if they disgraced their calling, not only would they suffer, but an injury would be entailed upon the whole Church. This similitude affords a forcible lesson, not only to individuals admitted by the

outward ceremony into this sacred union with the Church, but to jarring sects of Christians—those who on the one side say, “I am of Paul;” and those on the other, “I am of Apollos;” each insisting on that construction of Scripture which accords with the sect’s peculiar prejudices, as the exclusive rule of conduct. It becomes us to examine how far we are acting in accordance with the Divine will: “There shall be one fold and one shepherd;” to assure ourselves of the prospect of becoming members of that sacred flock—that holy throng, in which no schism must or can appear. Every true believer must sorrow that some portion of the Christian Church is ever incurring the Apostle’s admonition, “Continue in the unity of the Spirit in the very bond of peace.”

APPENDIX III.

SPECIMENS OF THE QUESTIONS PROPOSED AT THE WESTMINSTER CLASSES FOR SCHOOLMASTERS.

[Note.—When we commenced the Solutions, it was our intention to obtain a specimen paper of questions on each of the subjects brought under the notice of the masters of these classes. That such papers would have been interesting and valuable, there can be little doubt, since the express object of the establishment of the classes is the preparation of masters for undergoing the necessary examination for certificates. The limits of our work, however, will not admit of the accomplishment of our wishes in this respect; still, it is hoped the few specimen questions here appended will not be destitute of all the advantages such recognised papers would have afforded.]

QUESTIONS IN ARITHMETIC.

1. "The weekly wages of 12 men and 3 boys amounts to £13 19s. 6d., required the weekly wages of 15 men and 2 boys, if a man earns 10s. in the time that a boy earns 3s."

As a man earns 10s. in the time that a boy earns 3s., the value of a man's labour compared with that of a boy will be as 10 to 3.

Hence 1 boy does $\frac{3}{10}$, and the 3 boys will do $\frac{9}{10}$, the work of a man; therefore the 2 boys will perform $\frac{6}{10} \times \frac{2}{3} = \frac{2}{5}$ of a man's work.

The fractions $\frac{9}{10}$ and $\frac{2}{5}$ may, therefore, be substituted for, as being equivalent to, the value of 3 boys' and 2

boys' labour, respectively, expressed in the terms of what a man can do. The question will resolve itself thus:

If the labour represented by $12\frac{2}{10}$ cost £13 19s. 6d., what will be the cost of that represented by $15\frac{1}{2}$?

To solve which we have,

$$12\frac{2}{10} : 15\frac{1}{2} :: £13 \ 19s. \ 6d. : \frac{13\frac{1}{2}}{12\frac{2}{10}} \times 15\frac{1}{2} =$$

$$\frac{559 \times 78 \times 10}{40 \times 5 \times 129} = \frac{13 \times 13}{10} = £16 \ 18s.$$

2. "A boy in reducing 25 acres to poles, makes the mistake of multiplying by 4 and 28, instead of by 4 and 40; what *divisor* applied to his result will produce the right one?"

As the product $25 \times 4 \times 28$ has the factor 28 instead of 40; it follows that it must now be divided by 28, and then multiplied by 40; *i.e.*, $(25 \times 4 \times 28 \div 28) \times 40$. But since quantities may be multiplied in any order, we have, $25 \times 4 \times 28 \times 40 \div 28 = 25 \times 4 \times 28 \times \frac{4}{7}$.

Here we find that the correct result will be produced by applying $\frac{4}{7} = \frac{1}{1\frac{1}{2}}$ as a multiplier to the false result; but the question requires the number applied to be a divisor. Therefore invert $\frac{1}{1\frac{1}{2}}$, and we have the divisor required; thus,

$25 \times 4 \times 28 \div \frac{1}{1\frac{1}{2}} = 25 \times 4 \times 28 \times 1\frac{1}{2} = 4000$ poles.

3. "A and B are travelling in the same direction, at a uniform speed, A being $1\frac{1}{10}$ miles in advance of B. If A should diminish his hourly rate by 120 yards, how should B at the same time alter his hourly rate to come up with A in $3\frac{1}{2}$ hours?"

Had A continued at his original rate per hour, B would have had to increase his by $1760 \times 1\frac{1}{10} \div 3\frac{1}{2}$

= 880 yards per hour, in order to overtake A in $3\frac{1}{2}$ hours. But A decreases his speed by 120 yards per hour; therefore B will have to increase his 120 yards less than otherwise; $880 - 120 = 760$ yards per hour.

QUESTIONS IN MECHANICS.

1. "An engine of 20 horse power has a duty of sixty millions; required the number of bushels of coals it will consume in a day of 10 hours."

To comprehend this question, the import of "the horse-power," and "the duty" of a steam-engine must be fully understood. The power indicates the relative work any particular engine will perform compared with what can be done in the same time by a horse; which, according to Watt, performs 33,000 units of work per minute. (See Tate's Exercises in Mechanics, *Units of Work*.)

The duty of an engine is the amount of work it performs by the agency of the steam evaporated by the consumption of one bushel of coals. The duty of engines is various, arising from many causes; but experiments have shown that the same quantity of fuel evaporates a constant quantity of water. (See Tate's Mech., *Steam Power*.)

The horse-power of the engine in question is 20; therefore in a day of 10 hours it will perform

$20 \times 33,000 \times 60 \times 10 = 396,000,000$ units of work. But during the consumption of one bushel of coals, the engine performs 60,000,000 units of work.

$\therefore \frac{396,000,000}{60,000,000} = 6.6$ bushels of coals consumed per day.

2. "A train of 80 tons ascends a gradient having a

rise of $\frac{1}{4}$ in 100, with a uniform speed of 20 miles per hour. Required the horse-power, allowing friction at 7 lbs. per ton."

Here there are two distinct forces acting in opposition to that of the source of motion, or the power of the engine—friction and gravitation. The former of these in effect is given 7 lbs. per ton; *i. e.*, one ton is moved over the space of one foot by the application of a force equal to that required to raise 7 lbs. 1 foot, in opposition to gravity; or, in other words, seven units of work are performed in moving a ton horizontally one foot. In the latter power-absorbing force, the whole load, 80 tons, is actually raised, in opposition to gravity, to the extent of one inch every 25 feet the train proceeds.

Now, to calculate the horse-power of the engine, we must find the space in feet passed over per minute by the train; this multiplied by as many times 7 as there are tons in the train will give the units of work expended in opposition to the resistance of friction per minute; and next find the perpendicular height in feet to which the train is raised per minute: this, multiplied by the weight of the train in pounds, will give the units of work expended in that space of time in opposition to the force of gravitation. The sum of these units, thus exhausted, must evidently be equal to the whole labouring power of the engine. To express that in horse-powers, we have only to divide it by the number of units a horse can perform in the same time, a minute. Thus,

$$\begin{aligned} &\text{Space passed over per minute by train, } \frac{20 \times 5280}{60} \\ &= 1760 \text{ feet.} \end{aligned}$$

$\therefore 1760 \times 7 \times 80 =$ work due to friction per minute.

Height the train is raised per minute,

$$\frac{1760 \times \frac{1}{4}}{100} = 5.86 \text{ feet.}$$

$\therefore 5.86 \times 80 \times 2240 =$ work due to gravity per minute.

Total work of the engine,

$1760 \times 7 \times 20 + 5.86 \times 80 \times 2240 = 2,037,573.8$ units.

$$\therefore \text{Horse-power} = \frac{2,037,573.8}{83,000} = 61.7446$$

3. "In a condensing engine the length of a stroke is 6 feet; the steam is cut off at 2 feet of the stroke, the pressure of the steam 30 lbs. per square inch, and the elasticity of the vapour in the condenser is 3 lbs. Required the work performed on one inch of the piston in each stroke."

The work done by a steam-engine, working under high pressure, may be compared to the area of a rectangle; one side of which will represent the pressure of the steam, and the other the distance passed over by the piston or load. Thus, in the example before us, were the steam not cut off till after the completion of the stroke, the work done upon one inch of the piston during the stroke would be $30 \times 6 = 180$, which is the area of a rectangle whose sides are 30 and 6 respectively. But the rectangle will not apply when the steam is cut off at a certain point in the stroke, and the rest of it performed by the expansive power of the steam, except before the supply of steam is stopped; because the pressure, 30 lbs. in this case, becomes successively less as the piston progresses. By Marriotte's law, the pressure at any point of the stroke may be ascertained:—"The decrease of the pressure of an elastic fluid is in the same ratio as the increase of volume."

Now, supposing that portion of the stroke after the steam is cut off to be divided into any number of equal parts, and by the above law, finding the pressure at each

of those points, the work done by that portion of the stroke may be represented by the surface of an irregular figure, whose area can be found by the application of Simpson's rule; for, the base is represented by the length of the stroke to be performed after the steam is shut out; and the ordinates at equal distances upon that base, by the pressure at the points of the ordinates. (See Mensuration, Simpson's Rule demonstrated.)

In this example the steam will act expansively through four feet of the stroke. Let this distance be divided into spaces of six inches each, then the pressure on one inch of the piston, by Marriotte's law, at each of the points of division respectively, will be as follows:—

Pressure of steam at successive points of the stroke :
Where the steam is cut off 30 lbs.
At the 1st division, where the volume

is $2\frac{1}{2}$ feet	.. ..	30	$\times \frac{2}{2\frac{1}{2}}$	= 24 lbs.
At the 2nd,	volume, 3 feet	30	$\times \frac{2}{3}$	= 20 lbs.
„ 3rd	.. .. $3\frac{1}{2}$ „	30	$\times \frac{2}{3\frac{1}{2}}$	= 17.14 lbs.
„ 4th	.. .. 4 „	30	$\times \frac{2}{4}$	= 15 lbs.
„ 5th	.. .. $4\frac{1}{2}$ „	30	$\times \frac{2}{4\frac{1}{2}}$	= 13.3 lbs.
„ 6th	.. .. 5 „	30	$\times \frac{2}{5}$	= 12 lbs.
„ 7th	.. .. $5\frac{1}{2}$ „	30	$\times \frac{2}{5\frac{1}{2}}$	= 10.9 lbs.
„ 8th	.. .. 6 „	30	$\times \frac{2}{6}$	= 10 lbs.

Applying Simpson's rule, *i. e.*, “Add the extreme

ordinates to twice the odd, and four times the even ones : then multiply the sum by the third part of the common distance between them for the area of the figure ;" we have,

Work after steam is cut off,

$$\frac{1}{3} \left\{ 30 + 10 + 2(20 + 15 + 12) + 4(24 + 17 \cdot 14 + 13 \cdot 3 + 10 \cdot 9) \right\} = \frac{1}{3} (40 + 94 + 261 \cdot 36 = 131 \cdot 78.$$

Work of the first two feet of the piston's progress,
 $30 \times 2 = 60.$

But the vapour in the condenser acts against the effect of the steam to the extent of 3 lbs. per square inch of the piston ; therefore in the whole stroke from this source, we have, $3 \times 6 = 18.$

$$\therefore \text{The total work of one inch of the piston,} \\ = 60 + 131 \cdot 78 - 18 = 173 \cdot 78.$$

(For many excellent problems on steam power, with the application of Marriotte's law, and Simpson's rule, see several articles by Mr. Tate, in the *Mechanics' Magazine* for 1844.)

QUESTIONS IN ALGEBRA.

1. "A sets out from London to York at the same time that B sets out from York to London ; A arrives at York a hours, and B at London b hours after they met. In what time did each man complete his journey?"

To simplify the question, let c represent the whole distance ; which, however, does not enter as an element into the question.

Now, we want to find the length of time that elapses

before the parties meet, which added to a and b , gives the whole time A and B respectively are on the road.

Let x = this unknown time in hours.

Then $a + x$ = the time in which A completes the journey.

And $b + x$ = the time in which B completes the journey.

$$\therefore \frac{c}{a + x} = \text{A's rate per hour.}$$

$$\text{And } \frac{c}{b + x} = \text{B's } \quad \quad \quad ,,$$

Further, $\left(\frac{c}{a + x}\right) a$ = the distance A travels after meeting B.

But B has been x hours travelling the same distance. From the fact of which an equation of distance may be formed of the respective time and rate; thus,

$$\left(\frac{c}{a + x}\right) a = \left(\frac{c}{b + x}\right) x$$

Dividing across by c , and multiplying the factors in, we have

$$\frac{a}{a + x} = \frac{x}{b + x}$$

Multiplying each side by the respective denominators, we have

$$ab + ax = ax + x^2$$

$$\therefore x^2 = ab$$

And $x = \sqrt{ab}$, the time required.

Adding this to the time spent on the road after meeting, we have

Ansr. $a + \sqrt{ab}$ = A's time in completing the journey.

And $b + \sqrt{ab}$ = B's time in completing the journey.

(See Tate's Algebra, page 89, Question 4.)

$$2. \text{ " Given } \begin{cases} xy = x^2 - y^2 \\ x^2 + y^2 = x^2 - y^2 \end{cases} \quad \therefore \quad \dots \quad (1.)$$

$$\text{From (1), } 2xy = 2(x^2 - y^2) \quad \dots \quad (2.)$$

Subtracting (3) from (2),

$$x^2 - 2xy + y^2 = x^2 - y^2 - 2(x^2 - y^2) \quad (4.)$$

Dividing (4) by $(x - y)$,

$$x - y = x^2 + xy + y^2 - 2(x + y) \quad (5.)$$

$$\text{Transposing, } 3x + y = x^2 + xy + y^2 \quad \dots \quad (6.)$$

$$\text{Transposing eq. (1), } 0 = x^2 - xy - y^2 \quad \dots \quad (1.)$$

If the value of x be first required, add (6) and (1).

If the value of y be first required, subtract (1) from (6).

Thus, for x ,

$$\begin{aligned} 3x + y &= x^2 + xy + y^2 + (x^2 - xy - y^2) \\ &= 2x^2 \end{aligned}$$

$$\therefore y = 2x^2 - 3x$$

Substitute this value of y in equation (1),

$$2x^2 - 3x^2 = x^2 - (4x^4 - 12x^3 + 9x^2)$$

$$\text{Hence, } 4x^2 - 10x = -5$$

$$\therefore x = \frac{1}{4}(5 \pm \sqrt{5})$$

Thus two values of x are obtained. By substituting either of them in eq. (1), we obtain the corresponding values of y ; thus, taking the greater value of x ,

$$\frac{5 + \sqrt{5}}{4} y = \left(\frac{5 + \sqrt{5}}{4} \right)^2 - y^2$$

$$\text{Transposing } y^2 + \frac{5 + \sqrt{5}}{4} y = \left(\frac{5 + \sqrt{5}}{4} \right)^2$$

Completing the square.

$$\begin{aligned} y^2 + \frac{5 + \sqrt{5}}{4} y + \left(\frac{5 + \sqrt{5}}{8} \right)^2 &= \left(\frac{5 + \sqrt{5}}{4} \right)^2 \\ + \left(\frac{5 + \sqrt{5}}{8} \right)^2 &= 5 \left(\frac{5 + \sqrt{5}}{64} \right)^2 \end{aligned}$$

Extracting the square root,

$$y + \frac{5 + \sqrt{5}}{8} = \pm \frac{\sqrt{5}(5 + \sqrt{5})}{8} \quad .$$

$$\therefore y = \pm \frac{\sqrt{5}(5 + \sqrt{5})}{8} - \frac{5 + \sqrt{5}}{8}$$

By reducing this value of y , we have,

$$y = \frac{1}{2}\sqrt{5} \text{ or } -\frac{3}{4}(5 + \sqrt{5})$$

Now, retracing the steps from eq. (1), and subtracting it from (6), instead of adding them together, we have,

$$3x + y = x^2 + xy + y^2 \quad \dots \dots \dots (6.)$$

Subtracting eq. (1),

$$3x + y = x^2 + xy + y^2 - (x^2 - xy - y^2)$$

$$= 2xy + 2y^2$$

$$x(3 - 2y) = 2y^2 - y$$

$$\therefore x = \frac{2y^2 - y}{3 - 2y}$$

Substituting this value of x in eq. (1),

$$\frac{2y^3 - y^3}{3 - 2y} = \frac{4y^4 - 4y^3 + y^2}{(3 - 2y)^2} - y^2$$

Dividing across by y^2 , and at the same time clearing of fractions, &c.,

$$4y^3 = 5$$

$$\therefore y = \pm \frac{1}{4}\sqrt{5}$$

Find from (1) the value of x , as in the case with y .

The following process presents a method of discovering the ratio which subsists in eq. (1) between the value of x and y ; at least between one of their respective and corresponding values.

$$x^2 = y^2 + xy$$

$$\text{Hence } x^2 + \frac{x^2}{4} = y^2 + xy + \frac{x^2}{4}$$

$$\therefore \frac{\sqrt{5}}{2} x = y + \frac{x}{2}$$

And $\therefore y = \frac{\sqrt{5}-1}{2} x$

That is, $x : y :: 1 : \frac{\sqrt{5}-1}{2}$
 $:: 2 : \sqrt{5}-1$

3. "Given $x^3 + 12x = 12$, to find x ."

To bring this equation to the form of a quadratic, substitute $\left(z - \frac{4}{z}\right)$ for x . (See Tate's Algebra: Cubics.)

$$\text{Then } \left(z - \frac{4}{z}\right)^3 + 12\left(z - \frac{4}{z}\right) = 12$$

Expanding the first term, we have,

$$z^3 - 3z^2 \frac{4}{z} + 3z \left(\frac{4}{z}\right)^2 - \left(\frac{4}{z}\right)^3 + 12\left(z - \frac{4}{z}\right) = 12.$$

Simplifying this expression, and collecting like quantities, we have,

$$z^3 - \frac{64}{z^3} = 12$$

Hence, $z^6 - 12z^3 = 64$

Completing the square, $z^6 - 12z^3 + 36 = 64 + 36 = 100$.

$$\therefore z^3 - 6 = \pm 10$$

And $z^3 = 6 \pm 10 = 16 \text{ or } -4$

$$z = \sqrt[3]{16} \text{ or } \sqrt[3]{-4} = -\sqrt[3]{4}$$

Taking the former of these, and extracting the cube root, we have the approximate value of z ,

$$\begin{aligned}
 z &= 2.51984 + \\
 \text{But } x &= z - \frac{4}{z} \\
 \therefore x &= 2.51984 + - \frac{4}{2.51984 +} \\
 &= .9324 +
 \end{aligned}$$

Taking the minus value of z , and performing the same operation, we find $x = .9324 +$, which (singular to say), is identical with the previous value thus far, and doubtless to infinity, were the decimal places continued.

QUESTIONS IN GEOGRAPHY.

1. "What fixes the limits of the polar circles?"

The circles, which are 43° from the Tropic of Cancer and of Capricorn respectively, are limited in position by the combined effects of three circumstances; the obliquity of the earth's axis to its orbit, the earth's motion in that orbit, and the impossibility of a round body, such as the earth, being illuminated over more than one-half of its surface at the same time by the direct rays of a single luminary such as the sun. The amount of obliquity is $23\frac{1}{2}^\circ$, whatever position the earth may hold in its orbit.

Now, to show that these $23\frac{1}{2}^\circ$ transferred to length upon the surface of the earth, constitute the breadth of the Frigid Zone—the distance from the pole to the Arctic or Antarctic circle—and therefore define the limit of those circles, let us suppose an artificial globe to be placed before us, and a candle to be raised to the exact height of the wooden horizon, to represent the sun. Elevate the north pole $23\frac{1}{2}^\circ$, and at the same time place the globe so that the pole may point to the actual pole of the heavens; this is done by means of the compass

attached to the globe. Next place the candle due east, or due west, as indicated by that instrument. The former will represent the relative position of the earth at the vernal, and the latter at the autumnal equinox. In either of these positions the sun would be directly perpendicular to the equator, and his light would, consequently, during the twenty-four hours, remain an equal time (12 hours) upon every portion of the earth's surface; hence the application of the term Equinox—*equus*, equal; *nox*, night.

But let us represent the earth moving through the south-western quarter of its orbit, by moving our globe round till its north pole is directed towards the candle. This done, we shall have the relative positions of the earth and sun at the summer solstice. Mark, now, the change that has been gradually made by the circle of illumination. Previously, the candle shone perpendicularly to the equator, but now, in consequence of the inclination of the north pole towards the candle, it is perpendicular to a place the same number of degrees north of the equator as indicated by the elevation of the pole ($23\frac{1}{2}^{\circ}$). The illuminated circle extends, therefore, $23\frac{1}{2}^{\circ}$ beyond the north pole, and not so far as the south pole by the same distance. Now, while the globe and candle are thus placed, turn the former upon its axis, to represent the diurnal motion, and it will be seen that no part, within $23\frac{1}{2}^{\circ}$ of the north pole, will, during the revolution, be placed in the shade; and with the south pole *vice versa*, a distance $23\frac{1}{2}^{\circ}$ from it only will be in the shade during the whole revolution. The same appearances would take place at the winter solstice, the only difference being that the south pole would be illuminated and the north in the shade. Now these circles of light and darkness transferred to the artificial globe define the extent or breadth of the frigid zones, and are termed Arctic and Antarctic respectively. (See

Sullivan's Geography Generalised, in which this and other phenomena are very logically treated.)

2. "Give a list of the great mountain ranges of Europe, and the elevation of their highest peaks."

3. "What are the chief productions of mountains?"

4. "Where are the chief pine forests in Europe, and what do they produce?"

5. "Give a sketch of the physical geography of Spain."

6. "Give a list of the rivers which run into the Mediterranean, as they are naturally grouped, with their sources and the chief towns upon them."

7. "What manufactures are Rome, Berlin, Dresden, Florence, Naples, Leghorn, Birmingham, Northampton, and Nottingham famous for?"

8. "Give a sketch of the political geography of Austria."

QUESTIONS ON THE SCRIPTURES.

1. "What were the tenets of the Pharisees, and what Scriptures did they acknowledge?"

The Pharisees, who in numbers, apparent sanctity, and standing in society, constituted the principal of the various sects of the Jews, appear, according to Josephus, to have acquired considerable weight as a separate body by the time at which John Hyrcanus was high priest, a century prior to the birth of our Saviour. The etymological import of their name (from "pharash," denoting separation), indicates, although but faintly, the supercilious contempt in which they held not only neighbouring heathen, but even the poor and unprivileged of their own people. With their overweening estimation of their privileges, as descendants of the faithful Abraham, and of their deserts as strict observers of the law, were closely connected many of their tenets: thus, they held

that it was obligatory upon God to bestow his peculiar favour on the Jews, because they were the children of Abraham; and farther, that their great progenitor, through regard for his offspring, sat close by the gates of hell, and prevented even the most deserving of a place in that abode of darkness, to descend thither. They believed in the immortality of the soul, in opposition to the Sadducees; and that it would be either happy or miserable eternally; that there are angels and demons, and that the Divine blessings belonged to the Jews alone.

In addition to the Old Testament they held a number of traditions, as of equal and even greater importance than the Scriptures themselves. These traditions they pretended had their origin in Moses, and were transmitted through Aaron, Eleazer, Joshua, and the prophets, to the great sanhedrim. They were ultimately committed to writing at about the close of the second century; and then termed the Misna, which, with the Gemaras, or commentaries, made up the Talmud or Jewish code of doctrine.

A confused admixture of the doctrine of absolute predestination with free-will, ranked among the tenets of the Pharisees, as appears from Josephus, book xiii. chap. ix. of the Antiquities.

2. What did the great Jewish feasts commemorate?

3. Do any of the feasts of our Church correspond with them?

4. Show how the time, place, and manner of our Saviour's birth were limited by prophecy.

5. Give a concise account of the progress of Christianity during the fifty years after the ascension.

6. Give a concise history of the Book of Common Prayer.

APPENDIX IV.

EXAMINATION PAPERS PROPOSED AT ST. MARK'S COLLEGE, CHELSEA.

SCRIPTURAL KNOWLEDGE.

(One question only is to be answered in each section.)

Section 1.

Give dates for the following events :—

1. The passage of the Israelites over Jordan, and the commencement of the captivity.
2. The revolt of the ten tribes, and the edict of Antiochus Epiphanes.
3. The baptism of our Lord, and the death of Herod Agrippa.

Section 2.

What events are associated, historically, with the following places ?

1. Jerico.
2. Sidon.
3. Babylon.

Section 3.

Draw maps—

1. Of Judea in the time of our Lord.
2. Of the countries traversed by the Israelites in their journey from Egypt to the Promised Land.
3. Of the countries between Jerusalem and Rome, illustrative of the travels of St. Paul.

Section 4.

1. State, shortly, what is recorded of the deluge.
2. "When your fathers tempted me, proved me, and saw my works" (Ps. xcv. 9). To what events does this passage refer ?
3. Mention some of the allusions made in the New Testament to facts related in the Pentateuch ?

Section 5.

Describe—

1. The sacrifices of the great day of atonement.
2. The daily morning and evening sacrifices.
3. The feast of the passover, as observed in the time of our Lord; and compare it with the gospel narrative of the last supper.

Section 6.

1. In what words did our Lord explain the parable of the sower?
2. Enumerate, in their chronological order, the principal events connected with our Lord's journies from Jerusalem to Capernaum.
3. Collect from the different Evangelists the gospel narrative of the events recorded between our Lord's agony in the garden and his resurrection.

Section 7.

1. What prophecies having reference to the Messiah are to be found in the Pentateuch?
2. What prophecies have reference to the Messiah in his office as a Prophet, Priest, and King?
3. What did our Lord prophecy as the signs which should precede the destruction of Jerusalem?
4. Give passages from the Old Testament in which the Messiah is spoken of under the character of a Shepherd.

Section 8.

Give passages of Scripture illustrative of—

1. Justification.
2. Regeneration.
3. Sanctification.

And state the doctrine of the Church thereon, according to the tenor of her articles.

CHURCH HISTORY.

(One question is only to be answered in each section.)

Section 1.

Give dates for the following events :—

1. The testimony of Pliny, the younger, to the prevalence of Christianity.
2. The persecution of M. Antoninus.
3. The elevation of Gregory the Great to the Papal see.

Section 2.

1. What account is given by heathen writers of the persecutions to which the early Christians were subjected?
2. What testimony do heathen writers bear to the morality of the early Christians?
3. Give some account of the persecution of Diocletian.

Section 3.

1. Mention some of the names applied to the early Christians by themselves and by their enemies.
2. Into what classes were Christians divided in the Primitive Church.
3. What different orders of the ministry are spoken of in the New Testament, and what were those of the Primitive Church?

Section 4.

1. Enumerate the apostolic fathers, and give some account of one of them, and of his writings.
2. State some particulars as to the apologies of the early churches.
3. What was Gnosticism? What were the principal divisions of the sect of the Gnostics?

Section 5.

1. Under what circumstances did Constantine succeed to the empire?
2. What were the ecclesiastical divisions of the empire in his time, and what power did he assume in the administration of the affairs of the Church?
3. Give some account of the controversy in respect to image worship.

Section 6.

1. What testimony is borne to the existence of an early British Church?
2. State, shortly, under what circumstances the conversion of the Anglo-Saxons was effected.
3. What abuses had their origin in the pontificate of Gregory VII., and under what circumstances?

Section 7.

1. What were the dioceses of the Anglo-Saxon Church? Where did the clergy at first reside, and were preach? Under what cir-

cumstances did the payment of tithe originate ; and how was it appropriated ?

2. How did churches first come to be erected ? What was the origin of the division of parishes ; and what is the origin of lay patronage ?

Section 8.

1. In what points is the assimilation of Paganism and Popery apparent ?

2. Give some account of the martyr, Bilney.

3. By whom were the bishops of the English church originally nominated ? In whose reign did the pope obtain this power ? By what king was it resumed ? By whom was the statute of *praemunire* enacted, and with what objects ? In what respects does it still remain in force ?

Section 9.

1. Write out the Tenth Article, and give the Scriptural proofs.

2. Write out the Seventh Article, paraphrase it, state to what heresy it is opposed, and explain the last sentence in the first clause.

GREEK TESTAMENT.

Translate—

Καὶ ἐπηρώτων* αὐτὸν οἱ ὄχλοι λέγοντες· τί οὖν ποιήσωμεν* ; ἀποκριθεὶς* δὲ ἔλεγεν αὐτοῖς· ὁ ἔχων δύο χιτῶνας μεταδύτω* τῷ μὴ ἔχοντι, καὶ ὁ ἔχων βρωματὰ ὁμοίως ποιείτω· ἦλθον* δὲ καὶ τελῶναι βαπτισθῆναι καὶ ἔειπον πρὸς αὐτὸν· Διδάσκαλε, τί ποιήσωμεν ; ὁ δὲ ἔειπεν πρὸς αὐτούς· μηδὲν πλέον παρὰ τὸ διατεταγμένον* ὑμῖν πράσσετε· ἐπηρώτων δὲ αὐτὸν καὶ στρατεύομενοι λέγοντες· τί ποιήσωμεν καὶ ἡμεῖς ; καὶ ἔειπεν αὐτοῖς· μηδένα διασεῖσητε* μηδὲ συκοφαντήσητε, καὶ ἀρκεῖσθε τοῖς ὀψωνίοις ὑμῶν·

Parse the verbs marked *, and explain the formation of the tenses.

Trace the roots and explain the meaning of—
τελῶναι, συκοφαντεῖν, ὀψωνια.

Make a list of English words derived from words occurring in this passage.

Translate the sentence *ἦλθον δὲ καὶ τελῶναι, &c.*, into Latin.
In what war are the soldiers here mentioned supposed to have been engaged?

IV. Translate—

‘Οἱ δὲ ὄχλοι γνόντες ἠκολούθησαν αὐτῷ· καὶ δεξάμενος αὐτούς, ἐλάλει αὐτοῖς περὶ τῆς βασιλείας τοῦ θεοῦ, καὶ τοὺς χρέϊαν ἔχοντας θεραπείας ἰᾶτο· Ἡ δὲ ἡμέρα ἤρξατο κλίνειν· προσελθόντες δὲ οἱ δώδεκα εἶπον αὐτῷ, Ἀπόλυσον τὸν ὄχλον, ἵνα ἀπελθόντες εἰς τὰς κύκλῳ κώμας καὶ τοὺς ἀγρούς καταλύσωσι, καὶ ἔυρωσιν ἐπισιτισμόν· ὅτι ὧδε ἐν ἔρήμῳ τόπῳ ἐσμέν· εἶπε δὲ πρὸς αὐτούς, Δότε αὐτοῖς ὑμεῖς φαγεῖν· οἱ δὲ εἶπον, Ὅκ ἐῖσιν ἡμῖν πλεῖον ἢ πέντε ἄρτοι καὶ δύο ἰχθύες, εἰ μήτι πορευθέντες ἡμεῖς ἀγοράσωμεν εἰς πάντα τὸν λαὸν τοῦτον βρώματα· ἦσαν γὰρ ὥσει ἄνδρες πεντακισχίλιοι· εἶπε δὲ πρὸς τοὺς μαθητὰς αὐτοῦ, κατακλίνατε αὐτούς κλισίας ἀνὰ πεντήκοντα· καὶ ἐποίησαν οὕτω, καὶ ἀνέκλιναν ἅπαντας· λαβὼν δὲ τοὺς πέντε ἄρτους καὶ τοὺς δύο ἰχθύας, ἀναβλέψας εἰς τὸν οὐρανὸν, ἐυλόγησεν αὐτούς, καὶ κατέκλασε, καὶ ἐδίδον τοῖς μαθηταῖς παρατιθέσθαι τῷ ὄχλῳ· καὶ ἔφαγον καὶ ἐχορτάσθησαν πάντες· καὶ ἦρθη τὸ περισσεῦσαν αὐτοῖς κλασμάτων κόφινος ἑξήδεκα.

Show the different uses of the aorist and imperfect tenses in Greek.

Explain the force of ἀνὰ, and supply the allipse before κλισίας.

What accounts of this and a similar miracle are given by the other evangelists?

V. Translate—

Ἐν δὲ τῷ λαλῆσαι, ἡρώτα αὐτὸν φαρισαῖός τις ὅπως ἀριστήσῃ παρ’ αὐτῷ· εἰσελθὼν δὲ ἀνέπεσεν· ὁ δὲ φαρισαῖος ἰδὼν ἐθαύμασεν ὅτι οὐ πρῶτον ἐβαπτίσθη πρὸ τοῦ ἀρίστου· εἶπε δὲ ὁ κύριος πρὸς αὐτὸν, Νῦν ὑμεῖς οἱ φαρισαῖοι τὸ ἐξῶθεν τοῦ ποτηρίου καὶ τοῦ πίνακος καθαρίζετε· τὸ δὲ ἐσῶθεν ὑμῶν γέμει ἀρπαγῆς καὶ πονηρίας· ἄφρονες, οὐχ ὁ ποιήσας τὸ ἐξῶθεν, καὶ τὸ ἐσῶθεν ἐποίησε; πλὴν τὰ ἐνόντα δότε ἐλεημοσύνην· καὶ ἰδοὺ πάντα καθαρὰ ὑμῖν ἐστίν· ἀλλ’ οὐαὶ ὑμῖν τοῖς φαρισαίοις, ὅτι ἀποδεκατῶντε τὸ ἡδύοσμον καὶ

το πῆγανον καὶ πᾶν λάχανον, καὶ παρέρχεσθε τὴν κρίσιν καὶ τὴν ἀγάπην τοῦ θεοῦ· τᾶντα ἔδει ποιῆσαι, καὶ κείνα μὴ ἀφιέναι·

Explain the word ἀνέπεσεν.

Is there any difference between the classic and Hellenistic use of the word ἀριστον?

Mention any forms of words, or of expression, in this gospel which are peculiar to writers of the age and country of St. Luke, and give an account of his life.

CLASSICAL EXAMINATION.

First Class.

I. Translate—

Quare, quoniam id, quod primum, atque hujus imperii disciplinæque majorum proprium est, facere nondum audeo: faciam id, quod est ad severitatem lenius, ad communem salutem utilis. Nam, si te interfici jussero, residebit in re publica reliqua conjuratorum manus. Sin tu (quod te jamdudum hortor) exieris, exhaurietur ex urbe tuorum comitum magna et perniciose sententia rei publicæ. 13. Quid est, Catilina? num dubitas id, me imperante, facere, quod jam tua sponte faciebas? Exire ex urbe jubet consul hostem. Interrogas me, num in exsilium? Non jubeo: sed si me consulis, suadeo.

Give examples from Roman history which show the meaning of the first sentence.

Reliqua manus. Name the persons known to have been engaged in that conspiracy, or supposed to have favoured the designs of the conspirators.

Distinguish between consulere aliquem, and consulere alicui.

II. Translate—

Hæc igitur prima lex amicitiae sanciat, ut ab amicis honesta petamus, amicorum causâ honesta faciamus: ne exspectemus, quidem, dum rogemur: studium semper adsit, cunctatio absit: consilium vero dare guadeamus libere: plurimum in amicitia amicorum bene saudentium valeat auctoritas: eaque et adhibeatur ad monendum non modo aperte, sed etiam acriter, si res postulabit, et adhibitis pareatur.

What distinguished persons take part in this dialogue, and for what were they severally famous?

Give a brief account of P. Scipio Africanus.

III. Translate—

Sed in omni oratione, mementote, eam me laudare senectutem, quæ fundamentis adolescentiæ constituta sit. Ex quo id efficitur, quod ego magno quondam cum assensu omnium dixi: *Miseram esse senectutem, quæ se oratione defenderet.* Non cani, non rugæ repente auctoritatem arripere possunt: sed honeste acta superior ætas fructus capit auctoritatis extremos. Hæc enim ipsa sunt honorabilia, quæ videntur levia atque communia, salutari, appeti, decedi, assurgere, deduci, reduci, consuli; quæ et apud nos et in aliis civitatibus, ut quæque optime morata, ita diligentissime observantur. Lysandrum Lacedæmonium, cujus modo mentionem feci, dicere aiunt solitum, Lacedæmone esse honestissimum domicilium senectutis. Nusquam enim tantum tribuitur ætati, nusquam est senectus honorator. Quin etiam memoriæ proditum est, quum Athenis, ludis, quidam in theatrum grandis natu venisset, in magno concessu locum ei a suis civibus nusquam datum; quum autem ad Lacedæmonios accessisset, qui legati quum essent, certo in loco considerant, consurrexisse omnes, et senem illum sessum recepisse.

What persons are named in this dialogue, either as taking part in it, or as remarkable for their character and actions?

What were the views of the various sects of philosophers on the immortality of the soul? Give a brief account of the founders of the tenets of the principal schools of philosophy? To which did Cicero adhere?

CLASSICAL EXAMINATION.

I. To what family of languages does the Latin belong?

What modern languages are more or less remotely allied to the Latin?

II. On what occasion, and to what extent, have Latin words been introduced into our language?

From what part of their verbs are corresponding verbs in our language generally derived? Give instances of this.

III. What gender are these words—humus, pelagus, cadaver, æquor, caro, sanguis, and dies?

IV. Translate—

Quum Priscus Tarquinius occisus esset Tanaquil de superior parte domus populum allocuta est, dicens: regem grave quidem, sed non letale vulnus accepisse; eum petre, ut populus, dum convaluisset, Servio Tullio obediret.

Give the present, preterite, and supine of the verbs in this passage.

Why are *regem* and *eum* in the abjective and *S. Tullio* in the dative case?

Give a brief account of the reign of *Servius Tullius*.

V. Translate—

Dum Porsena urbem obsidebat, Qu. Mucius Scævola, juvenis fortis animi, in castra hostium se contulit, eo consilio, ut regem occideret. At ibi scribam regis pro ipso rege interfecit. Tum a regiis satellitibus comprehensus, et ad regem deductus, quum Porsena eum ignibus allatis terreret, dextram aræ accensæ imposuit, donec flammis consumta esset.

Conjugate the verbs in this passage.

Give a list of English words derived from words occurring in this passage.

To what nation did *Porsena* belong? What were the principal cities of the nation? What institutions did the Romans receive from them? What account is given of their origin?

VI. Translate—

Proficiscitur autem Cretam, ibique perpetuum exilium egit, abjicque in mare ossa sua moriens jussit, ne, reliquiis suis Lacedemonem relatis, Spartani se religione jurisjurandi solutos arbitrentur.

Why are *Cretam* and *Lacedemonem* severally in the accusative case?

By what are the mood and tense of the last word determined?

Give some account of the person to whom this passage refers.

VII. Translate—

Postquam in Urbem venerat, concione advocatâ sic verba fecit, ut nemo tam ferus fuerit, quin ejus casum lachrymarit, infimicumque his se ostenderit, quorum operâ patriâ pulsus fuerat, proinde ac si alius populus, non ille ipse qui tum flebat, eum sacrilegii damnasset.

Describe the character of the person here alluded to. Of what sacrilege had he been accused? Give an account of his death.

VIII. Translate—

Quum Agesilaus jam animo medicaretur proficisci in Persas, et ipsum regem adoriri, nuntius ei domo venit Ephorûm jussu, bellum Athenienses et Bœotios indixisse Lacedemoniis; quare venire ne dubitaret. Qui cum victori præset exercitui, maximamque haberet fiduciam regni Persarum potiundi, gloriosius tamen duxit, si institutis patriæ paruisset, quam si bello superasset Asiam.

Give some account of the Ephori.

Name the Grecian generals who obtained victories over the Persians before this time.

Who was king of Persia at this time ? Describe his character and the principal events of his reign.

LATIN COMPOSITION.

Translate one or more of the following passages into Latin, explaining by reference to Arnold's Exercises the differences which you may observe in each sentence between the English and Latin reigns.

I. As the laws of Draco were so cruel, that they could not be observed, Solon a man of remarkable justice was chosen, who might found, as it were, a new state with new laws. Which office he so discharged, that he obtained equal favour both with the commons and the nobles, who had previously been agitated by lasting contentions.

II. There remained one way through the Sequani by which the Helvetians could not go without the consent of the Sequani, on account of the narrowness of the pass. When they could not persuade them to do this of their own accord, they sent ambassadors to Dumnorix the Eduan, that they might obtain leave from the Sequani by his intercession. Dumnorix could do much with the Sequani by his personal influence and bounty, and he was friendly with the Helvetians, because he had married the daughter of Orgetorix from that state: and being excited by a desire of obtaining supreme power, he was aiming at a change in the government, and wished to have as many states as possible attached to himself by his kind offices. He therefore undertook the affair, and persuaded the Sequani to allow the Helvetians to pass through their territories; and induced them to exchange hostages, that the Sequani should not oppose the march of the Helvetians; and that the Helvetians should pass through without damage or injury.

III. If the influence of integrity be so great, that we love it even in those, whom we have never seen, or, what is more, even in an enemy: what wonder if the souls of men be stirred when they seem to have a clear insight into the virtue and goodness of those, with whom they can become connected by friendly intercourse? Love, however, is confirmed when benefits are received, and kindly feeling is observed, and intimacy is added; for when these are superadded to that first movement of the soul, and love, a striking greatness of affection begins to kindle into a flame.

But if there are any who suppose that this proceeds from weakness, in the hope that each person may have one, by whose means he may obtain the object of his desire, they certainly assign, so to speak, a low and ignoble origin to friendship, who assert that it is born of poverty and want.

ARITHMETIC.

(One example only is to be worked in each section.)

The examples marked with an asterisk are to be so worked as to render each step in the operation intelligible to a class in an elementary school.

Section 1.

- * 1. Subtract 347 from 938.
- * 2. Divide 2968 by 4.

Section 2.

- * 1. Show that $\frac{2}{3} = \frac{12}{18}$.
- * 2. Find the value of $\frac{3}{4}$ of $\frac{5}{6}$.

Section 3.

- * 1. Divide .004 by .00002.
- * 2. Extract the square root of 12.25.

Section 4.

- * 1. If 15 yards cost 5s. how many can be bought for 11s.?
- * 2. If 8 horses consume 7 bushels of oats in 9 days, how many bushels will 17 consume in 12 days?
- * 3. How many apples, at 4d. per dozen, are worth 150 apples at 8d. per score.

Section 5.

1. What sum put to interest will amount to £345 in 3 years at 5 per cent?
2. What rate of interest arises from money invested in the 3 per cents at 48?

Section 6.

1. If the carriage of 6 cwt. 3 qrs. for 124 miles cost £3 4s. 8d. what weight could be carried 93 miles for £3 0s. 7½d.?

2. Find the side of a square court-yard the expense of paving which, at 3s. 9d. per square yard, is £38 10s. 5d.

3. I bought a horse for 25 guineas and the same day sold him for 30 guineas, allowing 6 months credit, what did I gain per cent?

Section 7.

1. How many yards of carpet, 1 ft. 5 in. wide, will cover the floor of a room 22 ft. 6 in. long and 16 ft. 5 in. wide?

2. What is the weight of a rectangular block of stone whose edges are respectively 2 ft. 9 in., 1 ft. 5 in. and 1 ft. 11 in., and whose specific gravity is 4.973?

3. How many pounds of gunpowder, of which each cubic foot weighs 932 lbs., will fill a box whose height is 2 ft. 5 in., breadth 1 ft. 7 in., and length 5 ft. 9 in.?

Section 8.

1. A and B are partners in trade, A invests $\frac{8}{17}$ of the joint capital for $10\frac{1}{2}$ months, and B receives $\frac{6}{18}$ of the gain: how long was B's money invested?

2. A contractor puts 11 navigators to work on an excavation, and it is ascertained that, from the nature of the ground, if 7 of them be employed as pickmen and the rest as shovellers the work will be equally divided. On this understanding they are to be paid 5s. per day; to expedite the work another of the men is, however, required to take a pick: what additional wages are the shovellers entitled to?

HISTORY.

(One question only is to be answered in each section.)

Section 1.

1. State, shortly, under what circumstances the four great empires of antiquity succeeded each other.

2. Draw a map showing the limits of the Persian empire.

3. Give some account of the dissolution of the Macedonian empire.

Section 2.

1. Into what two great families does the ancient race of the Celts appear to have been divided? What representatives have

they at the present time? What ground is there for assigning to one of these families, at least, an Asiatic origin?

2. What incursions did the Gauls make into Greece? What territories did they take possession of in Asia Minor?

3. What Clans of the Celtæ were known to the Romans, and under what circumstances?

Section 3.

1. Under what circumstances and what emperor did the Romans finally abandon Britain?

2. In what way is the history of the great Constantine associated with that of Britain?

3. What monuments are there of the original inhabitants of Ireland? By what name was that country known from the fourth to the eleventh century? In what respects do its inhabitants, during that period, appear to have differed from the people whom they succeeded?

Section 4.

Give dates for the following events:—

1. The departure of the Romans from Britain, and the Norman conquest.

2. The accessions of Edward III. and George I.

3. The death of Charles I. and restoration of Charles II.

Section 5.

1. At what time, and under what circumstances, was the conquest of Ireland effected?

2. What were the British possessions in the time of Henry V.?

3. When, and under what circumstances, were the British possessions in France lost?

Section 6.

1. Who were the sovereigns of the line of Plantagenets? What children had Henry II.?

2. What was the title of Edward IV. to the throne?

3. Who were the great writers of the time of Queen Elizabeth? what were their principal works? and what were some of the characteristics of the literature of that period as compared with that of the time of Queen Anne?

Section 7.

1. What was the feudal system?

2. Give some account of the last of the Crusades.

3. What was the influence of the Crusades upon commerce and industry, and on the progress of civilization?

Section 8.

1. Give some account of the colonization of North America by the British.
2. When, and under what circumstances, did the fortress of Gibraltar become a British possession?
3. What was the foundation of the British power in India? Give some account of the present possessions of Great Britain in India.

GEOGRAPHY.

(One question only is to be answered in each section.)

Section 1.

1. Draw a plan of the college grounds, of the neighbouring roads and creek, and of the course of the river.
2. Draw a map of England showing its river system and watershed.
3. Draw a map of the United States of America.

Section 2.

Where are the following places situated, and for what remarkable?

1. Twickenham, Macclesfield, Redditch.
- Where are the following capes, or head-lands, situated?
2. Flamborough head, Beechy head, the Lizard point.
3. Describe the course of the river Thames.

Section 3.

Give a short account of one of the following countries :—

1. Portugal.
2. Norway.
3. Belgium.

Section 4.

Explain the methods used in projecting—

1. A hemisphere.
2. The map of Europe.
3. Mercator's projection.

Section 5.

In what respects are the wisdom and goodness of God apparent in the modifications of temperature produced by—

1. Latitude.

2. Elevation and aspect.
3. The distribution of land and water?

Section 6.

1. What property of water facilitates the radiation of its heat and by what wise provision is it, at a certain point, arrested?
2. Account for the cold of elevated regions.
3. Describe an Arctic winter.

Section 7.

1. Why do easterly winds prevail within the tropics, and westerly winds without them?
2. Why is the temperature of the western shores of great continents more equable than that of their eastern shores? Give examples of this.
3. Describe some of the great currents of the ocean, and account for them.

Section 8.

1. Account for the daily change in the time of high water, and for spring and neap tides.
2. When it is high water here, why is it high water also at the Antipodes?
3. Account for the deposition of dew, and explain why it is deposited in different quantities on different surfaces, and why in the greatest abundance on a cloudless night?

Section 9.

1. Give some account of the water-shed of Central Europe.
2. Define an isothermal line, and state what such lines form the northern limits of the following forms of vegetation, the sugar-cane, rice, the vine, wheat, barley, and oats.
3. Give some account of the leading features of the geology of England.

METHOD.

1. Write out the heads of a lesson on the answer to the question in the Catechism, "What is your duty towards God?"
2. Write out the heads of lesson on the history of the reign of Queen Elizabeth.
3. Describe the school of which you are the master, and give the results of your experience in the management of it.

THE ENGLISH LANGUAGE.

(One question only is to be answered in each section.)

Section 1.

1. Put the stops and capital letters to the following passage :—
 “be wise in choosing objects diligent in marking careful
 in remembering them yet herein men much follow their
 own humours one asked a barber who never before had
 been at court what he saw there oh said he the king was
 excellently well trimmed.”
2. Correct the following sentence :—
 “Who where the great writers of the time of george II
 what were there principle works and what where the carac-
 teristics of this period in our litterature as compared with
 that?”
3. Give reasons for the corrections to be made in the following
 sentences :—
 “Her Majesties service.”
 “I bought this book at Smiths, the bookseller.”
 And point out the difference between the meanings of the
 following :—
 “He is the Queen’s enemy.”
 “He is an enemy of the Queen’s.”

Section 2.

1. Give the English words derived from the Latin word *jacio*.
2. What are the derivations of the following words?—trans-
 gress, detriment, alone, agast, aghast, astronomy, telegraph.
3. Give examples of a noun formed from the past participle of
 a verb, a diminutive noun, and a frequentative verb.
4. To what languages are the following words common?—know,
 lick, sit.

Section 3.

Write a paraphrase of one of the following passages :—

1. “That is not the *liberty which we can hope, that no grievance*
ever should arise in the Commonwealth, that let no
man in this world expect; when complaints are freely heard,
deeply considered, and speedily reformed, then is the
utmost bound of civil liberty attained that wise men look
for.”—MILTON.
2. “It is *unnatural* for a man to court and hug *solitariness*;
 yet a *desert* is better than a debauched companion. The

Nazarites who might drink no wine were also forbidden to eat grapes *whereof* wine is made."—FULLER.

3. "All is not lost; the unconquerable *will*
And study of revenge, immortal *hate*,
And courage never to submit or yield,
And *what* is else not to be overcome,
That *glory* never shall his *wrath* or might
Extort from me;"

Section 4.

Parse the words printed in italics.

Section 5.

1. What evidence is there of an eastern origin of the languages of Central Europe?
2. What is the classification of the European languages?
3. What are the elements of modern English, and what is its history?

Section 6.

1. Give examples of six of the elementary sounds of the English language.
2. Distinguish between the sharp and flat mute consonants.
3. Under what circumstances does a combination of sharp and flat mute consonants in the same syllable become pronounceable? Give examples of this.

Section 7.

Transpose the following passage:—

"To preside in the public assembly of his countrymen, Gideon, the renowned champion of Israel, quitted the threshing-floor; and to lead the Roman armies to battle, Cincinnatus, the conqueror of the Volci, left his plough, and to return to his native fields, afterwards declined the rewards gained by his victories."

GEOMETRY, TRIGONOMETRY, AND MENSURATION.

(One question only to be answered in each section.)

Section 1.

1. Straight lines which are parallel to the same straight line are parallel to one another.

2. If two triangles have two sides of the one equal to two sides of the other, each to each, but the angle contained by the two sides of the one greater than the angle contained by the two sides equal to them of the other; the base of that which has the greater angle shall be greater than the base of the other.

3. In every triangle the square of the side subtending either of the acute angles is less than the square of the sides, containing it by twice the rectangle contained by either of these sides, and the straight line intercepted between the acute angle and the perpendicular let fall upon it from the opposite angle.

(The first case only of this proposition need be demonstrated.)

Section 2.

1. Similar triangles are to one another in the duplicate ratio of their homologous sides.

2. If one angle of a triangle be equal to the sum of the other two, the greatest side is double of the distance of its middle point from the opposite angle.

3. If from the point of intersection of the straight lines which beset two angles of an equilateral triangle straight lines be drawn parallel to the sides of the triangle they will trisect the sides.

Section 3.

1. Find the value of $\sin(2n + \frac{1}{2})\pi$
2. Show that $\sin a = \sin(60^\circ + a) - \sin(60^\circ - a)$
3. Show that $\sin(n + 2)a \cdot \sin na = \sin^2(n + 1)a - \sin^2 a$.

Section 4.

1. Find the value of $\sin 60^\circ$.
2. Expand $\cos(a + b)$
3. Having given two sides of a triangle, and the included angle investigate a method adapted to logarithmic calculation for determining another angle without first determining the third side.

Section 5.

1. From the top of a tower 100 feet in height, the angular depression of a distant object is observed to be 11 deg. 13 sec. What is the distance of the object?

2. To determine the distance from one another of two inaccessible objects C and D, by observations from stations A and B

in the same plane, whose distance AB is known. Example to be worked by construction—

$AB = 600$, $\angle CAD = 37^\circ$, $\angle DAB = 58^\circ 20'$, $\angle CBA = 53^\circ 30'$, $\angle DBC = 45^\circ 15'$.

3. The distance of three inaccessible objects, A , B , C (in the same plane) from one another are, respectively, 840, 760, and 1000 yards. These are observed at a distant point P , and the angle APB is found to be $22^\circ 11'$ sec., the angle APC $17^\circ 13'$ sec. Determine the position of P by construction, and its distance from the points A , B , C ; or show how these may be determined by calculation.

Section 6.

1. Define the logarithm of a number N to the base a : and show that—

$$\log_{10} \left(\frac{M}{N} \right) = \log_{10} M - \log_{10} N.$$

2. Expand αx .

3. Investigate an expression for determining the logarithm of a number to any given base in a converging series.

Section 7.

1. Investigate an expression for the area of a quadrilateral figure inscribed in a circle.

2. Expand $\sin mx$ in terms of $\sin x$.

3. Determine either angle of a spherical triangle in terms of its sides.

Section 8.

1. Investigate a rule for determining the area of a trapezoid.

2. What is the area of a circular plot of ground whose diameter is 27 chains.

3. The side of an octagon is 10 feet, what is its area?

4. A ring is generated by the revolution of an equilateral triangle whose side is three inches, about an axis parallel to one of its sides, and distant 6 inches from it. What is the solidity of the ring and its surface.

Section 9.

1. One side of a rectangular field is double the other; the field measures 20A. 0R. 19P., what are its sides?

2. Given the several offsets, 15, 25, 40, 10, 60, 30, 25, 8, 18, 9, 8, 4, 6, 0. taken at one chain's length. Required the area.

3. Required the plan and content of a four-sided field contained by straight lines according to the following field-book :—

..... 342	1360 = A D 1190 600 D go east	..... 625
Offsets left.		Offsets right.

ALGEBRA.

(One question only is to be answered in each section.)

Section 1.

Reduce to their simplest forms—

$$1. (-x + 3) - (x - 3) - (-5x + 6)$$

$$2. \frac{30a^2b - 6a^2c + 75ab^2 - 15abc}{15ab - 3ac}$$

$$3. \sqrt{3a^2c + 6abc + 3b^2c}$$

Section 2.

Reduce to their simplest forms—

$$1. \frac{x^2 - 2x + 1}{x^2 - 1}$$

$$2. \frac{a + \sqrt{-b}}{a - \sqrt{-b}} + \frac{a - \sqrt{-b}}{a + \sqrt{-b}}$$

$$3. \frac{\sqrt{abx + c^2}}{bc} + \frac{\sqrt{4ax}}{b} + \frac{\sqrt{abx + c^2}}{bc} - \frac{\sqrt{4ax}}{b}$$

Section 3.

$$1. \text{Involve } (\sqrt{2} - \sqrt[3]{3}) \text{ to the third power.}$$

2. Extract the square root of

$$\frac{1}{4} + 6x - 17x^2 - 28x^3 + 49x^4$$

3. Extract the square root of $3\sqrt{5} + \sqrt{40}$

Section 4.

Solve the following equations.

$$1. \quad \frac{x-a}{3} - \frac{2x-3b}{5} - \frac{a-x}{2} = 0$$

$$2. \quad \frac{11}{12x+11} + \frac{5}{6x+5} = \frac{11}{6x+11}$$

$$3. \quad \begin{cases} 2x + 5y - 7z = +288 \\ 5x - y + 3z = 227 \\ 7x + 6y + z = 297 \end{cases}$$

Section 5.

Solve the following equations.

$$1. \quad 3\sqrt{112-8x} = 19 + \sqrt{3x+7}$$

$$2. \quad x(y+z) = a, \quad y(x+z) = b, \quad z(x+y) = c$$

$$3. \quad x^3 + 3x - 14 = 0$$

Section 6.

1. At what price per head must a farmer purchase a flock of 100 sheep, that, expending £10 in feeding them, and losing 9, he may be able to sell the remainder at £2 each and gain £20?

2. I turn over the pages of a book by fours, and find three odd ones. I then turn them over by fives, and find two odd ones. The last time I do not turn them over so often by twenty times as I did the first. How many pages were there?

3. A passenger train and a luggage train, the one travelling at 10 miles per hour less speed than the other, set out at the same time, the one from London and the other from Carlisle, 210 miles apart, and pass one another at a certain station on the road. The passenger train sets out from Carlisle to return, two hours after the luggage train sets out to return from London; and it is observed that they pass one another at the same station. At what rate do they travel, and how far from London is the station?

Section 7.

1. The first term of an arithmetical progression is -7 , the number of terms 8, and the sum 28. What is the common difference?

2. A person sowed a bushel of wheat, and the next year he sowed again the produce of that bushel, and so on until the end of the third year he had a bushels. How many grains of wheat must each grain of seed have yielded, supposing it to have yielded the same number every year?

3. What is the present value of an annuity of $\mathcal{L}a$, which increases in a geometrical progression, whose ratio is r for n years, interest being assumed at p per cent. per annum?

Section 8.

1. Approximate by the method of continued fractions to the value of $\frac{587}{1943}$

2. Show in the above example that the approximating fractions must be alternately greater and less than the true value.

3. How can the fraction $\frac{230}{77}$ be divided into two others, whose denominations are 7 and 11?

MECHANICS AND ASTRONOMY.

(One question only is to be answered in each section.)

Section 1.

1. Define the unit of work, and show that if a pressure of m lbs. be exerted through a space of n ft., the number of units of work done is represented by $m \times n$.

2. How many tons of coals can be raised in 24 hours, from a depth of 20 fathoms, by a winding engine of eight-horse power?

3. In how long a time would a five-horse power engine empty a shaft 8 feet in diameter and 200 fathoms deep, which is full of water, and what would be the expense in coals if the engine did 30 millions duty?

Section 2.

1. How many horses, each exerting a fraction of 200 lbs., would be required to draw a waggon weighing, with its load, 5 tons, up a hill whose inclination is 1 in 18; the traction on the level road being estimated at 1-20th of the load?

2. A shaft 256 feet in depth is to be pumped dry by three men working in succession; to what depths must they respectively sink the surface, that each may do an equal share of the work?

3. On what principle is the power of an engine economised by working it expansively?

Section 3.

1. The section of a stream is 5 feet by 7, its mean velocity is 3 feet per second, and there is a fall upon it of 11 feet, working a wheel whose modulus is '6, how many quarters of corn will it grind in 12 hours, allowing a bushel per hour to each horse power?

2. A stone is let fall from the top of a tower 100 feet high, and at the same instant another is projected upwards from its base with a velocity of 20 feet per second, where will they pass one another?

3. A cubical block of stone rests upon a railway truck, what must be its dimensions (the weight per cubic foot being given), that it may just be overturned when the train, travelling with a given velocity, is suddenly stopped?

Section 4.

1. An iron bar 4 feet long, and weighing 15 lbs., is supported at its extremities in a horizontal position, and a weight of 28 lbs. is suspended at a foot from one end, what is the pressure upon each point of support?

2. What lading will a rectangular barge carry, whose length is 30 feet, breadth 6 feet, and depth 4 feet, each square foot of the iron weighing 9 lbs.?

3. A block of cast iron weighing 100 lbs. rests upon a plank of oak, inclined at 24 deg. to the horizon, what pressure acting parallel to the plane will draw it up it, and what down it; and what is the direction and amount of the *least* pressure which will draw it up and down; the limiting angle of resistance between iron and oak being 32 deg.?

Section 5.

1. How is it known that the earth is not a plane, and how is it known that it is a sphere? Give one reason, and the simplest, in each case.

2. Describe the apparent motions and the variations in brightness of one of the inferior planets.

3. Show that the apparent motions of the planets would be the same as we now observe them to be, if revolving round the sun, they also revolved with him, round the earth?

Section 6.

1. Show that the latitude of a place is equal to the apparent elevation of the pole at that place.

2. Explain the seasons. What are the astronomical causes of variation of temperature?

3. The moon revolves round the earth in 27·3 days, and the period between one new moon and another is 29·5 days. How is one of these numbers deduced from the other?

Section 7.

1. An immersion of one of Jupiter's satellites was observed at 10 h. 11 min. 43 sec. apparent time. The apparent Greenwich time of the immersion was, by the Nautical Almanac, 8 h. 13 min. 56 sec. What is the longitude of the place of observation?

2. Why do not eclipses return every month? Why are eclipses of the moon visible at all places of the earth's surface, where the moon is visible, and eclipses of the sun only at certain places where he may be seen?

3. How often would the same eclipses return if there were no regression of the moon's nodes?

Section 8.

1. How many geographical miles would a man travel, who changed his longitude 10 deg. travelling due east in latitude 45 deg.?

2. State Kepler's law of the equal description of areas, and prove it on mechanical principles.

3. Investigate a formula for determining the hour angle from an observed altitude of the sun; and explain how the true time is determined from the hour angle.

EXAMINATION PAPERS PROPOSED AT THE CHESTER DIOCESAN TRAINING COLLEGE.

SCRIPTURAL KNOWLEDGE.

(One question only is to be answered in each section.)

Section 1.

Give dates for the following events:—

1. The call of Abraham and the dedication of Solomon's temple.
2. The Exodus and the decree of Cyrus for the rebuilding of the temple.
3. The day of Pentecost and the captivity of St. Paul at Rome.

Section 2.

What events are associated historically with the following places?

1. Hebron.
2. Capernaum.
3. Corinth.

Section 3.

1. Draw a plan of the temple as it existed in the time of our Lord.
2. Draw a map of Jerusalem.
3. Draw map of the Holy Land.

Section 4.

Describe

1. The sacrifices of the great day of atonement;
2. The daily morning and evening sacrifices; and point out their typical character.

Section 5.

What prophecies have reference to the time of the advent of the Messiah, and how have they been fulfilled?

Section 6.

What events in the lives of,

- 1st. Elijah,
- 2nd. Peter,

afford subject for practical instruction?

Section 7.

State shortly the events which occurred between our Lord's agony in the garden and his ascension.

Section 8.

By what examples do the Scriptures rebuke

1. Worldly-mindedness,
2. Indifference in religion,
3. Formality in religion?

Section 9.

1. Write down the names applied in Scripture to our Saviour.
2. What offices are intimated under the name Christ, and in what sense have those offices been fulfilled?
3. Show that the Messiah was expected by the Jews as a temporal ruler.

CHURCH HISTORY.—(PALMER.)
EVIDENCES OF CHRISTIANITY.—(PORTEUS.)

(One question only to be answered in each section.)

Section 1.

1. Give some account of the persecutions of the Christians of the second century.
2. Who were the most illustrious of the fathers of the two first centuries?

Section 2.

1. What authority of Scripture and of antiquity is there for the use, in the services of the Church, of a language "understood of the people?"
2. When, and upon what pretence, were Latin services introduced in the Churches of northern Europe?

Section 3.

1. Give some account of the introduction of image worship, and of the councils by which it was respectively supported and condemned.
2. When, and under what circumstances, did the division of the Eastern and Western Churches take place?

Section 4.

1. What testimony is borne to the piety of King Alfred?
2. Give some account of Robert Grosteste, bishop of Lincoln.

Section 5.

1. Relate concisely the principal events in the public life of Martin Luther, giving as many of the dates as you can.
2. How long did the Popish party remain in communion with the Church during the reign of Elizabeth, and under what circumstances did they separate themselves?

Section 6.

By what argument is it proved

1. That the books of the New Testament were written by the persons to whom they are ascribed?
2. That in the facts they relate they could not be deceived themselves, and could have no inducement to deceive others?

Section 7.

1. Show that the character of our Lord, as represented in the gospel, affords strong grounds for believing that he was a Divine person.

2. Give a short summary of the evidences of Christianity, as stated by Bishop Porteus.

ARITHMETIC.

Each step in the solution of those questions which are marked with an asterisk, is to be fully explained.

*1. Subtract 69 from 88.

*2. Multiply 137 by 90.

*3. If 27 quires of paper cost 10s. 6d., what is the cost of 45 quires?

*4. Show that $\frac{2}{5} = \frac{6}{15}$

*5. Bought quills at 4s. 7d. the hundred, and sold them so as to gain $\frac{1}{8}$ of the selling price: what is the selling price?

*6. Find the value of $\frac{.002 \times .01}{.00005}$

*7. Eggs are to be sold at the rate of 3 for 2d.; how must they be bought to gain 25 per cent.?

8. What is the true discount on £124, payable in 2 years, at $4\frac{1}{2}$ per cent. per annum?

9. Bought wheat at 61s. per quarter, payable in 4 months, and sold it the same day at 65s. per quarter, payable in 7 months; what is the gain per cent. per annum?

10. Suppose the grass in a meadow to be of uniform quality and growth, and that, when the whole pasture is equivalent to 12 weeks' growth, 48 sheep will crop it down in four weeks; how long would it take 28 sheep to do the same?

ENGLISH HISTORY.

Section 1.

1. Enumerate the sovereigns named Plantagenet. Under what circumstances did they first ascend the throne?

2. Who were the sovereigns of the Tudor race, and what were

the circumstances under which they first ascended the throne of England?

Section 2.

1. Give dates for the following events :—The Norman Conquest, the ascension of Edward I., of Edward III., Charles I., William and Mary.

2. Give some account of the feudal system. Under what circumstances was it first introduced in England? In what respects was its operation controlled by the influence of the Saxon aristocracy, and by the old Saxon institutions of the country?

3. Give some account of the authority exercised by the Pope in England before the Reformation; and of the troubles to which, at different times, it gave rise.

Section 3.

What is the history of the Liturgy of the Church of England?

Section 4.

1. Under the authority of what Act of Parliament did George I. derive his right to the throne? What was his claim by descent? The claims of two other families, by descent, were superior to his; what families were they, and why were they set aside?

2. Give some account of the war of the "Spanish succession." In what circumstances did it originate, who were the principal leaders, and what the chief battles fought in it, and how did it terminate?

Section 5.

1. Enumerate the great naval engagements of the time of George III., and give the names of the commanders.

2. Give some account of the Peninsular war, and of the circumstances in which it originated.

GEOGRAPHY.

Section 1.

Draw a map

1. Of Chester and its environs.

2. Of England, showing distinctly its river system.

3. Of Europe.

Section 2.

1. Describe the county of Kent.
2. Describe the principal mountain ranges of England.
3. Contrast the objects familiar to our observation in England with those which surround the inhabitant of a tropical climate.

Section 3.

1. What places in England are historically the most remarkable?
2. Describe the mountain and river systems of Spain.
3. Describe an Arctic winter.

Section 4.

1. What is meant by the distinction of castes among the Hindoos? What are the names of their principal deities, and what the characteristic features in their religious belief?
2. Give some account of the climate of Hindostan, and of the periodical rains.
3. What are the principal groups of islands in the Pacific Ocean; by what races of men are they inhabited; by whom were they discovered, and what has been their subsequent history?

Section 5.

1. Account for the formation of clouds and rain; to what regions of the earth is the formation of clouds limited?
2. State what are the prevailing currents of the atmosphere, and account for them. Would a vessel bound to New Zealand and back make the voyage in an easterly or a westerly direction, and why?
3. The extreme summer heat of Nova Zembla is, probably, not less than that of London. Explain this.

GEOMETRY AND ALGEBRA.

Section 1.

1. Show that $2x + 3y - (x - 2y) = x + 5y$.
2. Multiply $3x^2 - \frac{2}{3}x + 5$ by $\frac{2}{3}x - 7$.
3. Divide $x^2 - (a + b)x + ab$ by $x - a$.

Section 2.

1. Reduce $\frac{x^2 + 2x - 3}{x^2 + 5x + 6}$ to its lowest terms.

2. Reduce to a single fraction

$$\frac{a^2}{a-x} + \frac{a^2}{a+x} + 2a$$

3. Solve the equation

$$3 \frac{128}{x-4} = 5 \frac{216}{x-6}$$

Section 3.

1. A farmer buys a flock of sheep at 20s. each, and after having kept them until the expences incurred upon them amount to £10 (during which time he has lost ten of them), he finds they have cost him 30s. each. How many were there in the flock?

2. The food of part of the inmates of a union-house is made of wheaten flour, and that of the rest of oatmeal. When the whole number of inmates is n , they eat a sacks of flour per day, and b of oatmeal; and when the number is N , they eat A sacks of flour per day, and B of oatmeal. How many will one sack of flour feed for one day, and how many one sack of oatmeal?

3. A passenger train and a luggage train, the one travelling at 10 miles per hour less speed than the other, set out at the same time, the one from London and the other from Carlisle, 210 miles apart, and pass one another at a certain station on the road. The passenger train sets out from Carlisle to return, two hours after the luggage train sets out to return from London; and it is observed that they pass one another at the same station. At what rate do they travel, and how far from London is the station?

Section 4.

Prove the following propositions:—

1. The greater side of every triangle subtends the greater angle.
2. Right lines which are parallel to the same right line are parallel to one another.
3. Equal triangles on the same base and on the same side of it, are between the same parallels.

Section 5.

1. If a right line be divided into any two parts, the squares of the whole line and one of the parts are equal to twice the rectangle contained by the whole line and that part, together with the square of the other part.
2. If two circles cut each other, they shall not have the same centre.
3. The angles in the same segment of a circle are equal.

MECHANICS.—(TATE.)

ASTRONOMY.—(COMSTOCK.)

Section 1.

1. Define the unit of *work*, and show, that if a pressure of m pounds be exerted over a space of n feet, the number of units of work done is represented by $m \times n$.

2. How many tons of coals can be raised in 24 hours from a depth of 90 fathoms by a winding engine of eight-horse power?

3. A shaft 256 feet in depth, and full of water, is to be pumped dry by three men working in succession; to what depths must they, respectively, sink the surface of the water, that each may do an equal share of the work?

Section 2.

1. A train weighing 90 tons descends a gradient of 1 in 400 steadily, at the rate of 40 miles per hour; what is the horse-power of the engine?

2. How many horses, each exerting a traction of 200 lbs., would be required to draw a waggon weighing with its load five tons, up a hill whose inclination is 1 in 18, the friction being 1 in 25?

3. How many units of work must be expended in carrying a ton of goods along a line of railway which ascends 3000 feet on a gradient of 1 in 50, then runs 10,000 feet on a level, afterwards descends 1000 on a gradient of 1 in 180, and lastly ascends 6000 feet on a gradient of 1 in 300?

Section 3.

1. A uniform bar three feet in length, and weighing 10 lbs., has weights of 20 lbs. and 10 lbs. suspended from its extremities; on what point will it balance?

2. Show that the distance of the centre of gravity of a triangle from its base is one-third of the height.

3. In the compound wheel and axle, if the diameters of the two axles be 12 inches and 9 inches, respectively, and the length of the handle 20 inches; what is the relation of the power and weight?

Section 4.

1. Investigate an expression for the work accumulated in a body of a given weight, and moving with a given velocity.

2. A train which weighs 400 tons, is travelling at the rate of 20 miles an hour; what friction must be put upon it by the breaks,

in addition to the friction of the rail, that it may be brought to rest within the space of 200 yards, the steam being thrown off?

3. A cubical block of stone, whose edge is three feet, and its weight 2000 lbs., rests upon one of the trucks of a railway train, which is suddenly stopped; what must be the velocity of the train in order that the block may just be overturned?

Section 5.

1. Account for the fact that the moon presents always the same face to us.

2. Under what circumstances is an eclipse of the sun total, or annular, or partial?

3. What is meant by the regression of the moon's nodes? How often would the same eclipses return if there were no such regression?

Section 6.

1. Why does the planet Venus never appear in opposition to the sun?

2. Explain, by the aid of a diagram, why it is that the sun's rays falling more obliquely in winter than in summer, heat us less?

3. What is the occasion of the variations in brightness of the planets, and of their retrograde motions?

Section 7.

1. The sun's meridian altitude towards the south was observed to be 67 deg. 19 min. 6 sec. on a day when his declination was 18 deg. 15 min. 19 sec. north of the equator. What was the latitude?

2. An immersion of one of Jupiter's satellites was observed at 10 h. 11 min. 43 sec. apparent time. The apparent Greenwich time of the immersion was, by the Nautical Almanac, 8 h. 13 min. 56 sec. What is the longitude of the place of observation?

3. The periodic time of Venus is 224 days; what is the interval between the conjunction of this planet with the sun and another?

MENSURATION AND LAND SURVEYING.

Section 1.

1. The diameter of a cylindrical vessel is 1 ft. 9 in., what is the area of its bottom?

2. How many square yards of paving are there in a trapezium whose diagonal measures 126 ft. 3 in., and perpendiculars 58 ft. 6 in. and 65 ft. 9 in.?

3. If the radius of the sector of a circle be 12 ft. 6 in., and the length of the arc 16 ft., what is its area?

Section 2.

1. Describe the carpenter's sliding rule. How may the area of a rectangle be found by means of it?

2. What is the solidity of a block of stone whose length is 3 ft. 5 in., its height 1 ft. 7 in., and its breadth 1 ft. 2 in.?

3. The length and breadth of a rectangular pond at the top are 132 yards and 64 yards, and at the bottom 116 yards and 48 yards. The perpendicular depth is 25 feet. How many cubic yards of earth have been taken from it?

Section 3.

Find the area of an irregular plot of land from the following notes:—

	A	B	
0	1314		126
234	1005		
	980	52	
	785	125	
312	700		
	555	152	
215	460		
	335	100	
336	260		
360	000		
From	A go	East	

THE PROPERTIES OF BODIES.—OPTICS.— (COMSTOCK'S MANUAL.)

Section 1.

1. Give examples of the divisibility of bodies.

2. " " attraction of cohesion.

3. " " malleability and ductility.

Section 2.

1. Give examples of the crystalline texture of bodies. Under what circumstances is it said to be dimorphous?

2. On what principle does the regulating power of the pendulum of a clock, or the balance spring of a watch, depend ; and what is the contrivance of the 'scapement' ?

3. Describe any one of the forms of the compensation pendulum, and explain it.

Section 3.

1. Show that the intensity of light varies inversely as the square of the distance between the luminous and the illuminated body. If the intensity of the light of a candle falling, at the distance of two feet, upon a screen, be represented by *unity*, by what number will that of the light falling upon a screen at seven feet distance, be represented ?

2. Explain what is meant by the refraction of light, and give illustrations of it.

3. Show that the effect of a concave mirror is to render parallel rays convergent. Where is the principal focus of a concave spherical mirror ?

Section 4.

1. Show that the effect of a convex lens, when placed before the eye, is to increase the visual angle, and that of a concave lens to diminish it.

2. Whence does the defect of vision, called longsightedness, arise ; and whence short-sightedness ?

3. Describe and explain the refracting telescope.

Section 5.

Describe the phenomena of the polarization of light.

Section 6.

Explain the rainbow.

AGRICULTURAL CHEMISTRY.

Section 1.

1. By what means may oxygen gas be best procured ? What are its properties, and how would you exhibit them to a class ?

2. Of what substances does the inorganic portion of plants consist ? How may it be separated from the organic portion, and what proportion does it bear to it in hay and wheat ?

Section 2.

1. How may carbonic acid gas be obtained? What are its properties?
2. Of what elements does carbonic acid consist, and in what proportions? Whence do plants obtain it, and by what organs? What portion of it do they give off in the act of drinking it?

Section 3.

1. How may the starch and gluten of flour be separated?
2. Of what two substances are woody fibre, starch, gum, and sugar composed, and in what proportions?

Section 4.

1. Whence is the inorganic or mineral portion of soils chiefly derived, and of what three substances does it principally consist?
2. What is the chemical constitution of bone-dust, to what lands is it especially a good manure, and why? Under what form is it best applied, and why?
3. Under what circumstances is ammonia produced naturally, what does it consist of, and on what does its efficacy as a manure depend?

GENERAL EXAMINATION OF SCHOOL- MISTRESSES.

AUTUMN, 1848.

Write at the top of the page, your name, age, and the time that you have been a mistress of an elementary school, the name of your school, and of the nearest post town.

This examination paper is divided into sections. You are not at liberty to answer more than one question in each section. Your knowledge and merit will be accounted greater if you answer the third question in each section, rather than the first or second.

The questions in each examination paper are intended to afford you an opportunity of showing the extent of your knowledge on that subject; and, if you are enabled to show a competent knowledge in a fair proportion of the subjects of examination, the committee of council will be disposed to grant you a certificate of merit.

SCRIPTURAL KNOWLEDGE.

Section 1.

1. Give an account of the patriarch Jacob, and state, briefly, the moral lessons to be learned from his history.
2. Describe and account for the condition of the kingdoms of Israel and Judah at the time of Hezekiah.
3. Give an account of the transactions in Jerusalem after the restoration of the Jews to the close of the Old Testament.

Section 2.

1. Narrate the chief events in the life of the prophet Daniel.
2. Mention the chief prophecies of Micah and Malachi, and show their fulfilment.
3. Quote the prophecies in Isaiah and Zachariah which refer to the divinity, incarnation, ministry, sufferings, and exaltation of Christ.

Section 3.

1. Give a full account of the particulars of the last week of our Lord's sojourn upon earth previous to his resurrection.
2. State, briefly, the chief events during the public ministry of our blessed Saviour. Relate instances in our Saviour's life of the devotional practices which we ought to imitate.
3. Name the females most distinguished for their graces in the New Testament, and instance in them, severally, the particular virtues which they illustrated.
4. Give an account of St. Paul's last journey to Jerusalem, and of the transaction which followed; and illustrate from that apostle's life the various duties and graces of Christians.

Section 4.

1. Prove from the epistles of St. Paul the typical character of institutions and transactions of the Old Testament.
2. Who were the Galatians? What are the chief subjects of St. Paul's epistle to them? Against what errors regarding the Jewish law did the apostle contend? What truths did St. Paul preach, prominently, in opposing these errors?
3. Quote passages from the epistles to show the necessity of repentance, faith, charity, and watchfulness, and the danger of worldly-mindedness, and indifference and formality in religion, and illustrate each quotation by an example from the Holy Scriptures.

CHURCH HISTORY AND LITURGY.

Section 1.

1. Give some account of the British Church before the Saxon invasion.
2. Into what parts of the island was Christianity driven by the Saxons, and under what circumstances was it re-introduced into England?
3. To what period and general causes should you assign the exorbitant growth of the Papal authority?

Section 2.

1. Give some brief account of Wiclif. Against what errors and abuses did he set himself? In what important points of doctrine did he differ from the reformed Church of England?
2. To what date, reign and circumstances, do you assign the final rupture between England and Rome?
3. Enumerate some of the benefits gained by the Reformation.

Section 3.

1. Give some brief account of the successive versions of the Bible.
2. When, and in whose reign, were the articles of our Church first published; and when were they reduced to their present form and number?
3. Mention, as nearly as you can, the number of persons who suffered for their religious professions during the reigns of Henry VIII., Mary, and Elizabeth, and give some short account of the lives and characters of any two of them.

Section 4.

1. Explain the meaning of the words — Collect, Offertory, Eucharist, Catholic, Litany, Anthem, Lent, Whitsunday, Pentecost Epiphany.
2. Give some account of the various revisions which our Prayer Book has undergone.
3. Write either the article of our Church upon baptism or that upon justification. Which article is it in number? Illustrate it from Holy Scripture.

ARITHMETIC AND BOOK-KEEPING.

Section 1.

1. Subtract 3708 from 4656, and explain each step in the process.
2. Find, by practice, the value of 36 cwt. 2 qrs. 16 lbs. at £3 7s. 8d. per cwt.
3. Required the value of 2937½ at 10½d.

Section 2.

1. What is the amount of a servant's wages for 215 days at 2s. 4½d. per day?
2. If 69 yards of carpet, 3 qrs. wide, cover a room 8 yds. 2 qrs. 2 nls. long; find the width of the room.
3. Quills were bought at 4s. 7d. per hundred, and were then sold so as to gain 3-8th of the selling price; what was the selling price?

Section 3.

1. In 5 2-3rds, 4, 8 1-3rd, and 4 2-3rds, how many thirds?
2. Add together 3-13ths of 9 8-15ths and 4-17ths of 8½.
3. Divide 3-4ths by 2-5ths, and explain the working.

Section 4.

1. Find the amount of £325 16s. 8d. at 4½ per cent. simple interest in 3½ years.
2. If 60 bushels of corn feed 6 horses for 50 days, in how many days will 15 horses consume 75 bushels?
3. What is the value of .655 of a day?

1. What is meant by *balancing* an account? and when is the balance entered *To*, and when *By*?

2. What is the difference between *Dr.* and *Cr.*? On which side would you enter *sales* and house expenses? Give your reason.

3. Explain what is meant by *Double Entry*, and state upon what principle the system of double entry is founded.

4. What is meant by *taking stock*?

DOMESTIC ECONOMY.

Section 1.

1. When bread is 3½d. per 2 lb. loaf, potatoes 1s. per peck of 15 lbs., and rice 4d. per lb., which is the cheapest food? What will be the price of the last two per pound when fit for eating?

2. What weight of bread will 2 lbs. of flour make, how much yeast will it require, and how long should it be baked? What substitutes may be used instead of yeast? What is their effect upon the bread, and why?

3. Mention any articles of food which, though cheap and nutritious, are little known to the poor; and describe, accurately, how they should be prepared.

Section 2.

1. What is the difference between boiling and stewing? Should potatoes be put on the fire in cold water or hot, and why?

2. What is the best method of taking stains out of linen? What is the effect of putting soda into the water in which things are washed? What are the best methods of washing coloured dresses and flannels respectively?

3. Write a letter to a young woman engaged as a housemaid giving her clear directions as to the nature of her work, and the best mode of doing it.

Section 3.

1. What are the comparative merits of calico and linen? Is stuff or cotton the cheapest material for children's clothes, and why?

2. Give an exact account of the manner in which a labourer's wife should lay out weekly wages to the amount of 9s., 12s., and 15s., if her family consists of herself, her husband, and two children.

3. Describe, fully, any changes in clothing, dwelling, and habits, by which the poor may improve their condition by the better application of their present means.

Section 4.

1. Mention some simple preventives of infection in visiting sick rooms, or in times of epidemic.

2. What are the ordinary causes, the best preventives, and the cheapest and simplest remedies of cough, cold, low fever, and rheumatism?

3. Explain the difference between inoculation and vaccination as preventives of small-pox. Mention the names of the persons by whom, and the dates at which, each was introduced into this country.

GRAMMAR.

Section 1.

1. Classify and define the various kinds of pronouns.
2. Define an adverb; give instances of different kinds of adverbs; and show how they are formed.
3. Classify the irregular past tenses and participles of verbs; give instances of obsolete forms from the Liturgy, or Holy Scriptures.

Section 2.

1. Explain what is meant by a simple, a complex, a principal, and an accessory sentence; and give examples of each.
2. State, clearly and fully, the rules for the use of relative pronouns; and write sentences to exemplify each rule.
3. Give instances of apposition, and of the nominative absolute; and explain the use of the subjunctive mood.

Section 3.

1. Write a list of purely English prefixes and affixes, and explain their several meanings.
2. Give instances of verbs, nouns, and adjectives, formed from other words by changing the vowels or consonants of the words from which they are derived.
3. Give the etymology and meaning of the following words:—Greenhithe, Windermere, Woodhurst, equivalent, agriculture, credible, oblation, monarchy, telescope, antitype, paraphrase.

Section 4.

" 'Tis pleasant, by the cheerful hearth, to hear
 Of tempests, and the dangers of the deep,
 And pause at times, to feel that we are safe :
 Then listen to the perilous tale again,
 And, with an eager and suspended soul,
 Woo terror to delight us.—But to hear
 The roaring of the raging elements,—
 To know all human skill, all human strength
 Avail not,—to look around and only see
 The mountain wave incumbent, with its weight
 Of bursting waters, o'er the reeling bark—
 Ah, me ! this is indeed a dreadful thing !
 And he, who hath endured the horror once
 Of such an hour, doth never hear the storm
 Howl round his home, but he remembers it
 And thinks upon the suffering mariner."

Express the sense of each sentence in the above or the following passage in simple prose :—

“ When I consider how my light is spent
 Ere half my days, in this dark world and wide,
 And that one talent which is death to hide,
 Lodg'd with me useless, though my soul more bent
 To serve thee with my Maker, and present
 My true account, lest he, returning, chide ;
 Doth God exact day-labour, light denied ?
 I fondly ask : but patience, to prevent
 That murmur, soon replies, God doth not need
 Either man's work, or his own gift ; who best
 Bear his mild yoke, they serve him best : his state
 Is kingly ; thousands at his bidding speed,
 And post o'er land and ocean without rest ;
 They also serve who only stand and wait.”

ENGLISH HISTORY.

Section 1.

1. Give a short statement of the origin and manners of the ancient Britons.
2. Write a brief account of the Venerable Bede, with dates.
3. State any circumstances, which you have read, of the introduction of Christianity into Britain, and of its re-establishment in the 6th century.

Section 2.

1. Who were the Normans ? Name the kings of the Norman line, with the dates of their accession, and manner of their deaths.
2. Mention some of the encroachments of the Papal power during the 11th and 12 centuries.
3. Enumerate the principal corruptions of the Church of Rome at the period of the Reformation.

Section 3.

1. Mention some of the most eminent men in the reign of Queen Elizabeth—poets, philosophers, statesmen, and admirals.
2. Show, by particular instances, the effect of the revocation of the Edict of Nantes on British manufactures.
3. What great visitations of epidemic or contagious disease has this country suffered since the Norman Conquest, and by what

circumstances affecting the condition of the people has their virulence been increased?

Section 4.

1. Narrate, briefly, some of the chief events in the history of the Church of England since the Reformation.

2. What effects on the moral and social condition of the people of England may be traced to her insular position?

3. Mention some of the most striking improvements in the domestic comforts of the labouring classes since the reign of Queen Elizabeth.

GEOGRAPHY.

Section 1.

1. Explain the terms—equator, ecliptic, zone, zodiac, meridian, zenith, and horizon.

2. Describe the course of the earth round the sun, and account for the changes of the seasons.

3. State the circumstances upon which the temperature, fertility, and healthfulness of different regions depend, and support your assertions by reference to districts in Great Britain and its dependencies.

Section 2.

1. Describe the course of the Severn and the Thames, naming the counties through which they flow, and the towns upon their banks.

2. Draw a map of the county in which you live, and describe its chief towns, population, productions, and the employment of its inhabitants.

3. Enumerate the dependencies of Great Britain in the western hemisphere, and describe the climate, productions, and condition of each.

Section 3.

1. Draw a map of Palestine at the time of our Saviour.

2. Describe the climate, productions, and physical features of Galilee.

3. Describe, accurately, the Valley of the Jordan, and mention the events connected with it in the Holy Scriptures?

Section 4.

1. Describe the course of the Elbe, the Seine, and the Tagus.

2. Name the countries on the shores of the Mediterranean sea, the religion of each, and its form of government.

3. Describe the Alpine range of Europe, name the countries which it separates, the rivers which descend from it, and the lakes connected with it.

NATURAL HISTORY.

Section 1.

1. Mention the wild flowers which are found in the greatest abundance in the district in which you live, and the time of year at which they are in bloom.

2. Plants may be said to sleep at night; name some of which show this by their leaves, and others which show it by their flowers.

3. Arrange, under separate heads, the most common plants, shrubs, and trees, which are poisonous in their leaves, fruit, or seeds.

Section 2.

1. Describe the different stages in the existence of a butterfly.

2. What indirect services do the earth-worm, the mole, the rook, and the toad, respectively render to man?

3. Define an *insect* and a *reptile*. To which denomination do snakes belong? Name the venomous and harmless snakes found in Great Britain.

Section 3.

1. Mention some of the birds of passage; the countries to which they respectively repair, when they leave our island, and the time of their departure.

2. What peculiarities, as to plumage, are observable in the song-birds, and, as to song, in birds of gay plumage? Mention instances and exceptions.

3. Show proofs of intelligent contrivance, in the duck, the web-foot of aquatic birds, and the wing of a stormy petrel.

Section 4.

1. What animals compose the feline tribe? Show their peculiar characteristics and habits in the instance of the domestic cat.

2. Name instances in which animals are providentially fitted both in the quality and the colour of their external covering, for the climate in which they are placed, and for the different seasons of the year.

3. Why is vaccination so called? Mention some of the animals which chew the cud; and describe any remnants of the ancient breed of wild cattle which are now to be found in England.

NOTES OF A LESSON.

Write out the heads of two lessons, supposed to be given to a section of 30 or 40 of your eldest children, selecting one subject out of each of two of the following lists.

1. **OBJECT LESSONS.**—On the human hand, or foot ; the horse, ox, sheep, or dog ; the bee or butterfly, the oak or holly ; the potatoe or cabbage ; the rose or pink ; gold, silver, iron, or coal ; the husbandman, miner, carpenter, or blacksmith.

2. **MORAL LESSONS.**—Truth, patience, industry, frugality, providence, with a reference to the local institutions for its encouragement—order, cleanliness, filial affection, mutual forbearance and assistance, love of home, love of country, obedience to parents and teachers, obedience to rules.

3. **A LESSON IN DESCRIPTIVE GEOGRAPHY.**—Selecting either the hills and water-sheds of England, and the rivers which flow from them ; or the coal-fields of England, and the chief towns and manufactures situated upon them ; or a description of the situation of some of the most remarkable downs, wolds, and grass-fells, fens, river-vallies, and plains of England, and the different kinds of agriculture pursued on them.

4. **A LESSON ON HISTORICAL GEOGRAPHY.**—Selecting one of the following subjects :—Describe the seat of domestic manufactures in England before the invention of the steam-engine ; or the situation of any two remarkable walled-towns in England which have stood sieges ; and relate the history of the woollen, silk, or cotton manufacture, describing the counties, or towns, in which they have flourished, and the local circumstances which have promoted their prosperity.

VOCAL MUSIC.*
Section 1.

1. Write down the tenor, treble, and bass clefs, and explain their several uses.

2. Describe, in detail, what is meant by the diatonic, and what by the chromatic scale.

3. Explain the distinction between the major and minor mood, showing precisely in what it consists.

* Here commences "Schedule B." See note to Vocal Music, Borough Road Papers.

Section 2.

1. What is meant by common, triple, and compound time—what by accent, and how does syncopation affect the latter?

2. Explain the meaning of C, $\frac{3}{4}$, $\frac{2}{4}$, $\frac{3}{8}$, $\frac{2}{8}$, $\frac{6}{8}$, respectively as indicating the time of a piece of music.

3. Are the different keys in music suited to give expression to different kinds of melody? Give examples.

Section 3.

1. How does the use of sharps and flats become necessary by transposition?

2. Explain what is meant by the tonic, the dominant, and the sub-dominant; and state why they are so termed.

3. How is modulation effected from one key to another, and what is the order in which the scales succeed each other, ascending and descending?

Section 4.

1. Write out the Old Hundredth in correct musical notation.

2. Write out the Old Hundredth and append the bass.

3. Write out the Old Hundredth, with the full harmony, in two or four lines.

ENGLISH LANGUAGE AND ETYMOLOGY.

Section 1.

1. What was the language of ancient Britain? Are there any remains of it now existing?

2. Are any writings of the Anglo-Saxon period preserved—what are they?

3. What languages were spoken in England during the reigns of the Norman kings; and how did they become blended together?

Section 2.

1. Name the principal English writer before the time of Elizabeth.

2. Name the great poets of the Elizabethan age, and give some account of their writings.

3. Name some of the principal English writers on biography, history, and on educational practical subjects.

Section 3.

1. What is meant by metaphor, simile, and hyperbole? Give instances of each.

2. What are the significations of the Latin prefixes ante, con, de, dis, in, intro, ob, pro, re, sub, trans? Give instances of each, and show how they are altered by assimilation.

3. Give instances of the principal forms of verse used by English poets.

Section 4.

Paraphrase the following passage, and carefully explain the construction of those parts of it which are printed in italics :—

Adam, *by this* from the cold sudden damp
Recovering, *and his scatter'd spirits returned,*
To Michael thus his humble words addressed :

*Celestial, whether among the thrones, or named
Of them the highest ; for such of shape may seem
Prince above princes ! gently hast thou told
Thy message, which might else in telling wound,
And in performing end us ; what besides
Of sorrow, and dejection, and despair,
Our frailty can sustain, thy tidings bring,
Departure from this happy place, our sweet
Recess, and only consolation left
Familiar to our eyes : all places else
Inhospitable appear, and desolate.
Nor knowing us, nor known.*

BIOGRAPHICAL MEMOIRS.

1. Wherein does biography differ from history ?
2. State your opinion as to the especial benefits resulting to children from the reading of a well-selected series of biography.
3. Write a short account of the lives of any two of the following remarkable persons :—

Mrs. Hutchinson,
Lady Jane Grey,
Lady William Russell,
Ann Askew,
Lady Derby,
Queen Philippa,

Henry Martyn,
Benjamin Franklin,
Columbus,
Howard the Philanthropist,
Mrs. Hannah More,
Elizabeth Fry.

If you do not happen to have read any account of the lives of any of the above, you are at liberty to select any two remarkable women with whose biography you are acquainted.

EXAMINATION PAPERS PROPOSED AT THE BOROUGH ROAD NORMAL SCHOOL.

AUTUMN, 1848.

Write, at the top of the page, your name, age, and the time that you have been the master of an elementary school, the name of your school, and of the nearest post town.

This examination paper is divided into sections. You are not at liberty to answer more than one question in each section. Your knowledge and merit will be accounted greater if you answer the third question in each section, rather than the first or second question.

The questions in each examination paper are intended to afford you an opportunity of showing the extent of your knowledge on that subject; and, if you are enabled to show a competent knowledge in a fair proportion of the subjects of examination, the Committee of Council will be disposed to grant you a certificate of merit.*

ENGLISH GRAMMAR.

Section 1.

1. Give the exact meaning and etymology of the words denoting the different parts of speech.
2. Point out and classify the different methods in which English nouns form their plurals.
3. What are the principal sources from which the English language is derived? State particularly the circumstances under which the different elements have become incorporated into it?

Section 2.

1. Show what inflections are employed in English to distinguish masculine from feminine nouns. Point out any of Latin origin.

* Each paper was thus headed, except that in the paper "Notes of a Lesson,"—the second paragraph, of course, was omitted; and also in the *four* papers on Languages, but its place supplied by the following:—

"Success in performing the exercise required in this paper will be received as an evidence of merit in any candidate, but it is not an indispensable condition of his receiving a certificate."

2. Describe what is meant by the terms *personal*, *relative*, *possessive*, *demonstrative*, *distributive*, *indefinite*, and *reciprocal*, as applied to pronouns.

3. Explain fully what you mean by *abstract nouns*; give some of the principal methods of forming them; and show their relation to *adjectives*.

Section 3.

1. What do the *moods* of verbs signify? Explain the meaning of the words *indicative*, *imperative*, *subjunctive*, *potential*, and *infinitive*, as applied to verbs.

2. State what agreement exists between a noun and its verb; between a personal or relative pronoun and its antecedent; and between personified words when in apposition with each other.

3. What is the *subject*, *predicate*, and *copula* of a proposition, and what the *agent* and *object* in a sentence? Give examples of each.

Section 4.

1. What are *diminutives*? Give their terminations, and show whence those terminations are derived.

2. Give some of the principal Latin prefixes to English verbs, and Greek prefixes to English nouns, explaining their precise meaning.

3. Give the derivation of the following words :—*Barometer*, *telegraph*, *sinecure*, *inefficient*, *inactive*, *aphelion*, *perihelion*, *oppose*, *project*, *transit*, *paraphrase*, *Chester*, *doxology*.

•• The following paraphrase must be made by all candidates.

Write down the meaning of the following passage in plain English prose :—

"The quality of mercy is not strained,
It droppeth as the gentle rain from heaven
Upon the place beneath; it is twice bless'd,
It blesseth him that gives, and him that takes;
'Tis mightiest in the mightiest, it becomes
The throned monarch better than his crown:
His sceptre shows the force of temporal power,
The attribute to awe and majesty,
Wherein doth sit the dread and fear of kings;
But mercy is above the sceptred sway,
It is enthroned in the hearts of kings,
It is an attribute of God himself;
And earthly power doth then show likest God's
When mercy seasons justice."

ENGLISH HISTORY.

Section 1.

1. By what different tribes or peoples was England invaded before the Norman conquest? Describe the character and habits of each.

2. Mention the different changes which took place in the political and religious state of Britain during the supremacy of the Saxons.

3. What important event took place at Runnymede—who were the principal actors in it—on what previous provisions were their claims founded—and in what did those claims consist?

Section 2.

1. Give a sketch of the kings of the Lancastrian line, and show what was their claim to the throne?

2. Give the time and circumstances under which Wales and Ireland were respectively connected with the English crown.

3. Give an account of the feudal system—and show how it was gradually abolished.

Section 3.

1. Give a sketch of the rise and progress of the wars of the Roses.

2. Give a short account of the events which led to the Reformation, and trace its history until finally established.

3. How long did the Protectorate last—what were the principal events which occurred during it at home and abroad—and who were the most prominent men in the history of the period?

Section 4.

1. What was the claim of the house of Hanover to the throne? Trace the genealogy of George I.

2. What is meant by the Union of England and Scotland—in whose reign did it take place—and what effects has it had upon the prosperity of the two countries?

3. Sketch the circumstances which led to the formation of the British rule in India upon the ruins of the Mogul empire.

GEOGRAPHY.

Section 1.

1. Name the principal seaports of the continent of Europe to the north of the straits of Dover.
2. What are the principal articles of import and export to and from the ports of the Mediterranean?
3. Draw a map of England, showing the several counties, the towns with more than 50,000 inhabitants, and the principal mining (M.) and manufacturing (Mf.) districts.

Section 2.

1. Mention the ranges of hills which form the principal watersheds of England, and the chief rivers that flow from each of them, and into what seas.
2. What are the principal English colonies in the eastern hemisphere, with their estimated population?
3. Enumerate the several states of the North American Union; describe in general terms their relative position; and give the names of their capital cities.

Section 3.

1. In what manner and to what extent does the figure of the earth differ from that of a sphere; and what is meant by the terms *zenith* and *nadir*, the *horizon* and *meridian* of a place?
2. What is meant by the *latitude* and *longitude* of any place on the earth's surface? What is the length of a degree of each in our own latitude, and what is the greatest distance from the equator at which the sun's rays are ever vertical?
3. Give the elevation of the perpetual snow-line above the level of the sea, at the arctic circle, in the latitude of London, at the equator, and 10 degrees to the north and south of it, with the causes of its diversity in these latitudes.

Section 4.

1. Mention the chief animal and vegetable productions which characterise the several zones.
2. What are the most marked diversities in the human race? Give their characteristics; and state the regions which they severally occupy.
3. Name those parts of the earth in which the Christian religion prevails, and those in which Mahommedanism, Buddhism, Brahminism, the Confucian system, and Fetishism severally predominate.

ARITHMETIC.

Section 1.

1. Explain each step in the process of subtracting 853 from 901.
2. Explain each step in the process of multiplying 3205 by 7030.
3. Explain each step in the process of dividing £132 7s. 3d. by 526, and express clearly what is the value of the remainder.

Section 2.

1. Find, by practice, the value of 7 cwt. 3 qrs. 5 lbs. at £6 17s. per cwt.
2. If 27 quires of paper cost 10s. 6d., how much will 45 quires cost? Explain each step in the process of working the sum.
3. If 3 acres of grass be mown by 7 men in 4 days, how many acres can be mown by 65 men in 15 days?

Section 3.

1. What is the interest of £415 15s. for 10 months at $4\frac{1}{2}$ per cent. per annum?
2. Reduce 2 qrs. 15 lbs. to the fraction of a cwt.
3. Multiply $68\frac{1}{2}$ by $\frac{2}{3}$ of $\frac{1}{4}$ and divide $\frac{2}{3}$ by 25.

Section 4.

1. Divide 7.01 by .006, and give the reason for the place of the decimal point in the result.
2. Reduce $\frac{4}{7}$ to a decimal fraction.
3. Extract the cube root of 58.7564, and state why you divide the number into periods at the commencement of the process.

GEOMETRY.*Section 1.*

1. Define a circle and a segment of a circle, a scalene triangle a rhomboid, and a trapezium.
2. Disect a given rectilineal angle.
3. Prove that straight lines that are parallel to the same straight line are parallel to each other.

Section 2.

1. Prove that parallelograms upon equal bases and between the same parallels are equal to one another.

2. Describe a parallelogram that shall be equal to a given triangle, and have one of its angles equal to a given rectilineal angle.

3. Prove that if the square described upon one of the sides of a triangle be equal to the squares described upon the other two sides of it, the angle contained by these two sides is a right angle.

Section 3.

1. Prove that if a straight line be divided into any two parts, the rectangle contained by the whole and one of the parts, is equal to the rectangle contained by the two parts, together with the square of the aforesaid part.

2. Prove that if a straight line be divided into two equal and also two unequal parts, the squares of the two unequal parts are together double of the square of half the line, and of the square of the line between the points of section.

3. Prove that in obtuse-angled triangles, if a perpendicular be drawn from either of the acute angles to the opposite side produced, the square of the side subtending the obtuse angle is greater than the squares of the sides containing the obtuse angle by twice the rectangle contained by the side upon which, when produced, the perpendicular falls, and the straight line intercepted without the triangle between the perpendicular and the obtuse angle.

Section 4.

1. Divide a given straight line into two parts, so that the rectangle contained by the whole and one of the parts shall be equal to the square of the other part.

2. Describe a square that shall be double a given triangle.

3. Prove that the diagonals of a parallelogram bisect each other.

ALGEBRA.

Section 1.

1. What is the approximate value of

$$4a\sqrt{(b^2 - ac)} + \sqrt{(4ac + e^2)}$$

a being $= 6$, $b = 5$, and $c = 4$.

Q

2. Add together $\frac{a+b}{2}$ and $\frac{a-b}{2}$

and subtract $\frac{1}{2}(a+b)$ from $\frac{1}{2}(a-b)$

3. Multiply $4x^3 - 3x^2y + 3y^3$ by $5x^3 + 3x^2y - 5y^3$
and divide $a^3 - x^3$ by $a + x$.

Section 2.

1. Reduce the following fraction to its lowest terms :

$$\frac{2x^3 - 16x - 6}{3x - 24x - 9}$$

2. Add together $\frac{1}{2} + \frac{2}{3} + \frac{5}{7} + \frac{a}{4} + \frac{3b}{5c} + \frac{6x}{9y}$

3. Required the square root of $4a^2 - 12ax + 9x^2$
and the fifth power of $(a+b)$ by the binomial theorem.

Section 3.

1. What is the value of x in the following equation ?

$$\frac{x}{2} + \frac{x}{4} + x = \frac{x}{3} + 17.$$

2. The first term of an arithmetical series is 1, the common difference 2, and the sum of the series 55; required the number of terms, with the rule for finding them.

3. Given $\frac{x+3}{2} + \frac{x}{3} = 4 - \frac{x-5}{4}$

Section 4.

1. If 6 be added to a certain number, and the sum multiplied by 7, the product will be 63; required the number.

2. The difference of two numbers is 3, and 3 times the less is equal to twice the greater; required the numbers.

3. Explain the different methods of elimination in equations of two unknown quantities; and solve the following :

$$\frac{x}{7} + 7y = 99 \text{ and } \frac{y}{7} + 7x = 51$$

4. A and B commence trade with different sums of money; A gains £40, and then his capital is twice B's; A then loses £80, and B gains £70; and then B's capital is 6 times A's. How much had each at first?

MENSURATION.

Section 1.

1. Find the area of a rhombus whose side is 5 ft. 7 in., and perpendicular height 4 ft.

2. A triangular field, 738 links long and 583 links in the perpendicular, produces an income of £12 a-year; at how much an acre is it let?

3. How many square feet are there in a circle whose circumference is 6·2832 feet?

Section 2.

1. How many gallons will a cistern hold whose depth is 23 ft. 6 in. and diameter 4 ft. 9 in.?

One imperial gallon contains 277·274 cubic inches.

2. A triangular gable, 18 feet high, of 1 brick thick, is raised on an end wall, 20 ft. long and 30 ft. high, of 2 bricks thick; what is the cost of the whole at £4 a standard rod?

3. If from a right cone, whose slant height is 30 feet, and circumference of base 10 feet, there be cut off by a plane parallel to the base a cone of 6 feet in slant height, what is the surface of the frustum remaining?

Section 3.

1. A field in the form of an equilateral triangle contains half an acre; what must be the length of a tether fixed at one of its angles to enable a horse to graze exactly half of it?

2. Suppose the ball on the top of St. Paul's to be 6 ft. in diameter, what would the gilding of it cost at 3½d. per square inch?

3. What weight of powder will fill a cylinder whose height is 3 ft., and diameter of base 10 inches?

Section 4.

1. Describe the theodolite, and explain its uses.

2. Explain how the changes of level are ascertained preparatory to constructing a sewer.

3. What is the nature of the different errors to which the instruments used in levelling are liable?

MECHANICS.

Section 1.

1. A cubic foot of water weighs 62·5 lbs. What amount of work will it take to raise 20 cubic feet 12 yards high?

2. What must be the horse-power of an engine to pump 87 cubic feet of water per minute from a depth of 60 fathoms?

3. Required the horse-power of an engine which moves a train whose weight is 100 tons, the speed 20 miles per hour, and the friction 8 lbs. per ton.

Section 2.

1. How many kinds of levers are there? Give familiar examples, and show the relative position of the power to the weight, and the mechanical advantage in each case.

2. How far from the fulcrum must a power of 7 lbs. be applied so as to balance a weight of 126 lbs. placed at a distance of 2 inches from it?

3. The length of an inclined plane is 80 ft., the height 2 ft., the weight 2 tons; what power must be applied to move the body up the plane, the resistance of friction being 1-30th of the load.

Section 3.

1. Let there be two moveable pullies, weighing 4 lbs. each; what must be the power when the weight is 180 lbs.?

2. What power must be applied to the wheel and axle, the radius of the wheel being 20 inches, and that of the axle 4 inches, to support a weight of 400 lbs.?

3. Explain the theory of falling bodies, and give particular examples to show the relation between the *space*, the *time*, and the *velocity*.

Section 4.

1. Explain the principle of the parallelogram of forces; and state what is meant by the resolution and composition of forces.

2. Explain what is meant by the *centre of gravity*, and show how to determine the centre of gravity of a triangle, a pyramid, and any four-sided figure.

3. State the condition to be fulfilled in order that any number of forces not acting on a single point may balance each other. What is the nature of the proof of this principle?

POPULAR ASTRONOMY.

Section 1.

1. What is the exact length of the year?
2. What is the Metonic cycle?
3. What modes have in different ages been adopted to remedy the inconveniences that might arise from the year not consisting of an integral number of days?

Section 2.

1. Name the principal constellations in the northern hemisphere, and describe how you would find them in the sky.
2. What is a nebulous star? Mention some of the most remarkable.
3. Do any of the stars vary in brightness? What account has been given of this?

Section 3.

1. If the moon is attracted by the earth, what prevents it from falling like a stone?
2. At what rate does light travel? And how has that rate been determined?
3. To what practical purposes have the eclipses of Jupiter's moons been applied; and what difficulties attend such an application?

Section 4.

1. Why does the moon always present the same face to us?
2. What is the exact form of the earth's orbit? How would you describe it upon paper?
3. Mention some of the principal comets, the kind of orbits they describe, and the length of time employed in their revolutions.

NOTES OF A LESSON.

Write out the heads of two lessons, supposed to be given to a section of thirty or forty of your eldest children, selecting one subject out of each of two of the following lists.

1. OBJECT LESSONS.—On the human hand or foot; the horse, ox, sheep, or dog; the bee or butterfly; the oak or holly; the

potatoe or cabbage ; the rose or pink ; gold, silver, iron, or coal ; the husbandman, miner, carpenter, or blacksmith.

2. MORAL LESSONS. — Truth, patience, industry, frugality, providence with a reference to the local institutions for its encouragement, order, cleanliness, filial affection, mutual forbearance and assistance, love of home, love of country, obedience to parents and teachers, obedience to rules.

3. A LESSON IN DESCRIPTIVE GEOGRAPHY. — Selecting either the hills and water-sheds of England, and the rivers which flow from them ; or the coal-fields of England, and the chief towns and manufactures situated upon them ; or a description of the situation of some of the most remarkable downs, wolds, and grass-fells, fens, river-valleys, and plains of England, and the different kinds of agriculture pursued on them.

4. A LESSON ON HISTORICAL GEOGRAPHY. — Selecting one of the following subjects : — Describe the seat of domestic manufactures in England before the invention of the steam-engine ; or the situation of any two remarkable walled towns in England which have stood sieges, and relate the chief circumstances of those sieges ; or relate the history of the woollen, silk, or cotton manufacture, describing the counties or towns in which they have flourished, and the local circumstances which have promoted their prosperity.

VOCAL MUSIC.*

Section 1.

1. What clefs are chiefly used ; what kinds of voices do they severally indicate ; and how are they written ?

2. Write the symbol, and give the explanation of the *shake*, *turn*, *pause*, *swell*, *slur*, and *repeat*.

* This and the following eight papers, together with " Drawing from Models," comprehend " Schedule B." The subjoined extract, from an official circular letter, will now explain itself.

" The subjects in Schedule A ought to be professed by all candidates for certificates, but a more extensive knowledge of these subjects must be shown by candidates for the two higher classes of certificates. The Committee of Council will, however, permit a candidate for the third or lowest certificate to substitute two of the subjects in Schedule B for a similar number of subjects in Sche-

3. What is meant by saying that a melody is written in a given *key*? Write down the sharps and flats to be used in the following keys: A *b major*, B *minor*, F \sharp *major*, D *b major*, and B *b minor*.

Section 2.

1. Explain the different kinds of *time* used in music, with their appropriate symbols.

2. What is meant by a *major* and what by a *minor* chord? Give examples of each.

3. Explain what is meant by the common chord, in its three positions; show also what is meant by the discord, the chord of the flat seventh, and that of the diminished seventh.

Section 3.

1. What is the order in which the keys follow each other, ascending or descending?

2. What is modulation, why is it used, and what is the difference between a natural and an abrupt modulation?

3. Explain what is meant by the *tonic*, the *dominant*, the *sub-dominant*, the *mediant*, and the *leading note*; and state what consecutive intervals are inadmissible in musical composition.

Section 4.

1. Write out the *National Anthem* in correct musical notation.

2. Write out the *National Anthem* with the bass.

3. Write out the *National Anthem* with the full harmony.

ENGLISH LANGUAGE AND ETYMOLOGY.

Section 1.

1. To what family of languages does the Anglo-Saxon belong, and by whom are its cognate branches now spoken?

2. Give instances of Anglo-Saxon words found in connection with the social life, political history, and geography of England.

dule A. A large and liberal acquaintance with the subjects in Schedule A might entitle a teacher to one of the two higher classes of certificates; but generally the examination of candidates who succeed in obtaining one of the two latter classes of certificates will have been extended to some of the subjects in Schedule B."

3. When did the mixture of the Saxon and the Norman French begin to take place, and what records have we of the early English language?

Section 2.

1. Who were the great poets of the Elizabethan age, and what are their principal writings?

2. What political and theological literature flourished during the Protectorate and the reign of Charles II.?

3. Name the principal English writers on history, the English constitution, mental and moral philosophy.

Section 3.

1. Give instances of Saxon, Norman, Latin, and Greek words now used in English, and state for what purpose the latter are generally used, with examples.

2. What is meant by a *metaphor*, a *simile*, an *hyperbole*, and *personification*? Give instances of each.

3. What is the signification of the Saxon affixes, *er*, *ess*, *ling*, *ness*, *hood*; the Latin affixes *tor*, *trine*, *sion*, *ose*, *fic*, *ferous*; and the Latin prefixes *ante*, *con*, *de*, *dis*, *sub*, *trans*, with an example of each?

Section 4.

1. Give the etymology of the words, *artificial*, *affected*, *influence*, *prejudice*, *suffer*, *sophism*, *democracy*, *catastrophe*, *apology*, *ecstasy*.

2. What is the signification of the Greek prefixes, *an*, *amphi*, *apo*, *cata*, *dia*, *epi*, *hyper*, *para*, *peri*, *syn*. Give examples of each.

3. Give the etymology of *Edinburgh*, *Chipping*, *Colchester*, *Snowdon*, *Anglesey*, *wayfaring*, *gangway*, *Greenhithe*, *Norwich*, *Essex*, *gospe!*.

FRENCH.

Translate the following passage:—

Telle *était* la discipline des premiers Romains, qu'on y *avait* vu des généraux condamner leurs enfants à *mourir*, pour avoir sans leur ordre gagné la victoire: mais quand ils furent mêlés parmi les barbares, il y contractèrent un esprit d'indépendance, qui *faisait* le caractère de ces nations; et si l'on *lit* les guerres de Bélisaire contre les Goths, on *verra* un général, presque toujours désobéi par ses officiers.

Sylla et Sertorius, dans la fureur des guerres civiles, *aimaient* mieux périr que de faire quelque chose dont Mithridate pût tirer avantage : mais dans les temps qui suivirent, dès qu'un ministre ou quelque grand, *crut* qu'il *importait* à son avarice, à sa vengeance, à son ambition, de faire entrer les barbares dans l'empire, il le leur donna d'abord à ravager.

Parse the words printed in italics.

Write out the verb *aimer* complete.

Express in French the following sentence :—How is your brother ? They told me he was ill.

GERMAN.

Translate the following passage :—

Die Federn einer Gans *beschämten* den neugebornen Schnee. Stolz auf dieses blendende Gewand der Natur, *glaubte* sie eher zu einem Schwane, als zu dem, was sie *war*, geboren zu *sein*. Sie sonderte sich von ihres Gleichen ab, und *schwamm* einsam und majestätisch auf dem Teiche umher. Bald *dehnte* sie ihren Hals, dessen verrätherischer Kürze sie mit aller Gewalt *abhelfen wollte*, bald suchte sie, ihm die prächtige Biegung zu *geben*, in welcher der Schwan das würdigste *Ansehen* eines Vogels des Apollo *hat*. Doch vergebens ; er war zu steif, und mit aller ihrer Bemühung *brachte* sie es nicht weiter, als dass sie eine lächerliche Gans ward, ohne ein Schwan zu *werden*.

Decline *Schwan* throughout with the definite article.

Give the mood and tense of the verbs printed in italics, and write out their principal parts.

GENERAL HISTORY.

Section 1.

1. Give some account of Xerxes' expedition against Greece.
2. Name the principal Hellenic races, and show where they lived.
3. Give some account of the Peloponnesian War ; state from what sources we draw our information respecting it, and mention any of the leading men of that age.

Section 2.

1. Who was the last of the Roman kings—why was he expelled—how, and by whom ?

2. Who were Pyrrhus and Hannibal? Give some account of their struggles with the Roman empire.

3. Describe the main features of the Roman Republic; and mention any of the leading statesmen and orators who figured in it.

Section 3.

1. Who was Mahomet; what event in his life forms the great Mahomedan era; and what countries did the Saracens subsequently subdue?

2. Give some account of the first Crusade, and state what influence the Crusades generally had upon European society.

3. Who was the last Greek emperor of Constantinople; by whom was his throne overturned, and what was the state of Christianity in the East at that period?

Section 4.

1. When did the Reformation formally commence in Germany? what sovereigns took part for or against it?

2. Give some account of the life of Peter the Great, of Russia.

3. Give a description of the court of Louis XIII., stating what was the character and policy of Richelieu.

PHYSICAL SCIENCE.

Section 1.

1. Explain what is meant by attraction of cohesion, and give instances of it.

2. Why is it that different bodies fall on the earth with different velocities, and under what circumstances would they all fall with the same velocity?

3. Give an exact account of Atwood's machine for estimating the velocities of falling bodies, and describe its operation.

Section 2.

1. At what rate does sound travel? Are there any means of accelerating its velocity?

2. What is an echo? Mention any remarkable echoes or whispering galleries, and describe their peculiarities?

3. What relations exist between the length, thickness, and tension of strings, and the sounds produced by their vibrations?

Section 3.

1. How do fluids act in the way of pressure? Explain the principle of the hydrostatic bellows.
2. What is the difference between high-pressure and low-pressure engines?
3. Explain, accurately, the nature of a syphon, and state, precisely, on what principles its action depends.

Section 4.

1. Describe, accurately, the refracting and the reflecting telescopes, and state the advantages and disadvantages of the latter.
2. Give an exact description of the hydrometer, and state its uses.
3. Explain the exact functions of the lungs of animals, and state what effect they have upon the blood, and how this effect is produced.
4. What is the meaning of chemical equivalents? Give an account of Dalton's Atomic Theory.

HIGHER MATHEMATICS.

Section 1.

1. Find x from the equation— $3x^2 - 7x = 136$.
2. Find x and y from the equations—

$$\left. \begin{aligned} x^4 + y^4 &= 17 \\ x + y &= 3 \end{aligned} \right\}$$
3. A regiment of soldiers is drawn up in a solid square, and has 12 men over. After losing 60 men they are again drawn up in a solid square, and now there are 11 men over. How many men were there in the regiment at first?

Section 2.

1. Prove the rule for summing a geometrical series. How may this rule be applied to find the value of a circulating decimal?
2. What is harmonic progression, and how are questions relating to it most easily worked?
3. What is the method of summing series by orders of differences? Sum the series $1^3, 2^3, 3^3, 4^3$, &c., to n terms.

Section 3.

1. Describe an isosceles triangle having each of the angles at the base double of the third angle.

2. Bisect a given triangle by a straight line drawn through a given point in one of the sides.

3. Prove that a solid angle is composed of plane angles which are together less than four right angles.

Section 4.

1. Find $\cot A$ when $\cot 5 A = \cos 3 A$.

2. Find $\tan \pi A$ in terms of $\tan A$.

3. Find the equation to the tangent to the ellipse.

4. Find the number which raised to the power of itself gives the largest result.

LATIN.

1. Translate the following passage :—

Themistocles, post *victoriam ejus belli*, quod cum Persis fuit *dixit in concione* : *Se habere consilium reipublicæ salutare*, sed id *sciri* opus non esse : postulavit ut aliquem populus *daret*, quicum communicaret. Datus est Aristides. Huic ille dixit : *Classem Lacedæmoniorum, quæ subducta esset ad Gytheum, clam incendi posse* ; quo facto *frangi* Lacedæmoniorum *opes* necesse esse. Quod Aristides cū audisset, in concionem *magnā expectatione venit* ; dixit que : Perutile esse consilium, quod Themistocles *afferat* ; sed minimè honestum. Itaque Athenienses, quod honestum non esset, id ne utile quidem putaverunt ; totamque eam *rem*, quam ne *audierant* quidem repudiaverunt.

2. Decline throughout the nouns printed in italics in the above passage.

3. Parse the verbs printed in italics, and give their principal parts.

4. Translate the following sentence into Latin :—The Romans conquered all nations, but were at last themselves conquered.

5. What were the powers of the Consul, Prætor, Quæstor, and Ædile, in the time of Cicero ?

6. Translate into English the following passage :—

Olli certamine summo

Procumbunt : vastis tremit ictibus ærea puppis,

Subtrahiturque solum ; tum creber anhelitus artus

Avidaque ora quatit ; sudor fluit undique rivis.
 Attulit ipse viris optatum casus honorem.
 Namque furens animi dum proram ad saxa suburget
 Interior spatioque subit Sergestus iniquo,
 Infelix saxis in procurentibus hæsit.
 Concussæ cautes, et acuto in vertice remi
 Obnixi crepuere, illisaque prora pependit.
 Consurgunt nautæ et magno clamore morantur ;
 Ferratasque trudes et acutâ cuspide contos
 Expediunt, fractosque legunt in gurgite remos.

GREEK.

1. Translate the following passage :

Ἐντεῦθεν ἐξελαύνει σταθμόν ἓνα παρασάγγας πέντε,
 ἐπὶ πύλας τῆς Κιλικίας καὶ τῆς Συρίας. Ἦσαν δὲ
 ταῦτα δύο τεῖχη· καὶ τὸ μὲν ἔσωθεν πρὸ τῆς Κιλικίας
 Σθένεσις εἶχε, καὶ Κιλικίων φυλακὴ· τὸ δὲ ἔξω, τὸ
 πρὸ τῆς Συρίας, βασιλέως ἐλέγετο φυλακὴ φυλάντ-
 τειν. Διὰ μέσον δὲ τούτων ῥεῖ ποταμὸς, Κέρσος,
 ὄνομα, εὖρος πλεθρον. Ἄπαν δὲ τὸ μέσον τῶν
 τευχῶν ἦσαν στάδιαι τρεῖς. καὶ παρελθεῖν οὐκ ἦν
 βίβη· ἦν γὰρ ἡ πάροδος στενὴ, καὶ τὰ τεῖχη εἰς τὴν
 θάλατταν καθήκοντα, ὑπερφεν δὲ ἦσαν πέτραι ἡλί-
 βατοι· ἐπὶ δὲ τῷς τείχεσιν ἀμφοτέροις ἐφεισθήκεσαν
 πύλαι. Ταύτης οὖν ἕνεκα τῆς παρόδου Κῦρος τὰς
 ταῦδ' μετεπέμψατο.

2. Parse ἐξελαύνει, σταθμόν, τεῖχη, βασιλέως, φυλάττειν,
 ῥεῖ, παρελθεῖν, ἐφεισθήκεσαν, μετεπέμψατο.

3. Conjugate the verb ἔχω. What change in the breathing
 takes place in the future tense? Mention any instances of a
 similar change in verbs or nouns.

4. Decline φυλακὴ, τεῖχος, and ὄνομα throughout ; and give
 the first person singular present tense of all the moods of λέγω
 and λέγομαι.

5. Translate the following passage :—

Ἰδόντες δὲ οἱ μαθηταὶ αὐτοῦ Ἰάκωβος καὶ Ἰωάννης
εἶπον· “Κύριε, θέλεις εἰπῶμεν πῦρ καταβῆναι
ἀπὸ νοῦ οὐρανοῦ, καὶ ἀναλῶσαι αὐτούς, ὥς καὶ
Ἡλίας ἐποίησε;” Στραφεῖς δὲ ἐπετίμησεν αὐτοῖς
καὶ εἶπεν· “Οὐκ οἶδατε οἶον πνεύματός ἐστε ὑμεῖς;
ὁ γὰρ υἱὸς τοῦ ἀνθρώπου οὐκ ἦλθε ψυχὰς ἀνθρώπων
ἀπολέσαι, ἀλλὰ σῶσαι.” Καὶ ἐπορεύθησαν εἰς
ἐτέραν κώμην.

6. What is the constitution of θέλεις εἰπῶμεν?

APPENDIX V.

CERTIFICATES OF MERIT.

AWARDED BY THE COMMITTEE OF COUNCIL ON EDUCATION, IN THE YEAR ENDING ON THE 30TH OF JUNE, 1848.

Trained Schoolmasters, Schoolmistresses, and Students, who have obtained Certificates of Merit, after having been examined by one or more of Her Majesty's Inspectors of the National School at Battersea, Chelsea (St. Mark's), and Whitelands; and at the Training Institutions of the Chester, Salisbury, and York and Ripon Diocesan Board of Education.

The names in each division of the classes are arranged in alphabetical order.

Names marked * were students when examined.

NATIONAL SOCIETY'S TRAINING INSTITUTION AT BATTERSEA.

Examination conducted by Her Majesty's Inspectors of Schools, the Rev. Henry Moseley, M.A., F.R.S., formerly Professor of Natural Philosophy and Astronomy in King's College, London, Inst. Reg. Parris Corresp.; and the Rev. Alexander Thurtell, M.A., Fellow and lately Tutor of Caius College, Cambridge.

MIDDLE CLASS CERTIFICATE.

FIRST DIVISION.

Goodall, J., Northampton, Blue Coat School
Hagger, H. J., Kirkdale, Lancashire, Industrial School
Hammond, W., Wanstead, Commercial Travellers' Schools
Marriott, J. W., Bloomsbury, St. George's, in London

- Pinder, W., Foxdale, Isle of Man, National School
- Wilkins, W., Charter House, St. Thomas', in London.

SECOND DIVISION.

- Christie, A. J., Windsor, National School
- Christie, J. A., Milton Abbott, Devonshire, Free School
- Jeffery, B. A., Dunchurch, Warwickshire
- Krinks, W. H. Woodford, Cheshire
- With, G., Alverstoke, Hampshire, National School.

THIRD DIVISION.

- Bate, J., Newtown, St. Mary's
- Blackburn, J. W. C., Denbigh, National School
- Castle, C., New Swindon, Great Western Railway Company's School
- Diggins, A., Congleton, Cheshire
- Easton, W., Bridgwater, Dr. Morgan's Endowed School
- Packett, J. W., Stepney, Middlesex, Red Coat School
- Woolard, G., Thorney Abbey, Cambridgeshire.

LOWER CLASS CERTIFICATE.

FIRST DIVISION.

- * Aspin, S., Leeds, Marshall's Factory School
- Biggs, J. Clifton, Gloucestershire, National School
- Courtney, J., Bristol, Hannah More's School
- Diggins, J., Liverpool, St. Mark's
- Hirst, M., Dowlais, Glamorganshire
- Lake, W. J., Worcester, St. John's
- Neild, B., Eccles, Lancashire, National School
- Ryan, J., Orby, Lincolnshire
- Tregenza, J. L., Trevenston, Cornwall

SECOND DIVISION.

- Burrows, J., Brimington, Derbyshire, Parochial School
- Carvill, T., Loughborough, Free School
- Cox, T., Chester, St. Mary's
- Dakin, F., Redbank, St. Thomas', in Manchester
- Dixon, G., Diglis, Worcestershire, National School
- Hallows, J., a student
- Joyner, W., Calne, Wiltshire, National School
- Peach, J., Cockermouth, Pauper School
- Woolley, J., Abbot's Anne, Hampshire.

THIRD DIVISION.

- Adams, T. A., Llamidloes, Montgomeryshire, National School
- Bailey, J., Sandbach, Cheshire, Church School

Baker, W., Coseley, Staffordshire
 Braid, A. J., New Swindon, Great Western Railway Company
 Brand, P., Parkhurst Prison School, in the Isle of Wight
 • Brown, J., Worcester, St. Martin's, National School
 Carvill, H., Epsom, National School
 Davis, J., Liverpool, Kirkdale, Industrial School
 Holmes, W., Harborough Magna, Warwickshire
 • Reid, J., Bilston, St. Mary's National School
 Rice, G. T., Bangor, Endowed School
 * Rookwood, W., Christ Church, St. George's in the East, London
 • Ryde, W., Newcastle-upon-Tyne, St. John's, National School
 Sheard, T., Stockton-upon-Tees, Blue Coat School
 Sluter, J., Dudley, St. Edmund's
 Thackeray, J., Leeds, St. Paul's
 Thomas, W. M., Rugham, Norfolk.

NATIONAL SOCIETY'S TRAINING INSTITUTION AT CHELSEA (ST. MARK'S COLLEGE).

Examination conducted by Her Majesty's Inspectors of Schools,
 the Rev. Henry Moseley, M.A., F.R.S., with the assistance of
 the Rev. F. C. Cook, M.A., and the Rev. E. Douglas Tinling,
 M.A., Her Majesty's Inspectors of Schools.

HIGHER CLASS.

THIRD DIVISION.

Mayne, J. P., Chelsea, Parochial School.

MIDDLE CLASS CERTIFICATE.

FIRST DIVISION.

Anderson, J., Brighton, St. John's.

SECOND DIVISION.

Glass, E., Westbourne, Diocesan School
 Lakin, S., St. Mary's Church, Devonshire
 M'Queen, J., Horbury, Yorkshire
 Morgan, C., Windsor, St. Mark's
 Row, W., Liverpool, St. Martin's.

THIRD DIVISION.

Benham, W., a student
 Biggs, S., a student

Collard, E. C., East Farleigh, Kent
 Gibbs, G., Reading, St. Mary's
 Lucas, W., Westminster, Blue Coat School
 Morrison, J. R., Baldwin's Gardens, in London, National School
 Trigg, J., Morpeth, St. James'
 Welch, H. W., Broughton, St. John's, Lancashire.

LOWER CLASS CERTIFICATE.

FIRST DIVISION.

Arnold, H., a student
 Jones, J., Helliden, Northamptonshire
 Percival, J., a student
 • Veness, W., Cranley, Surrey, National School.

SECOND DIVISION.

Hanford, H. M. M., a student
 Trott, T., Bridgnorth, National School.

THIRD DIVISION.

Aishton, J., Christchurch, Russell-sq., London, National School
 Brewin, A., a student
 Bond, W., a student
 Bunker, T., Buntingford, Hertfordshire, National School
 Hephher, J., Duxford, Cambridgeshire, National School
 Lake, G., a student
 Lomax, J., a student
 Manning, W. B., Ely, National School
 Rendall, J., Ormskirk, Lancashire
 Stanton, J., a student
 Wooder, J., Hardwick, Derbyshire.

NATIONAL SOCIETY'S INSTITUTION AT WHITELANDS, CHELSEA,

FOR THE TRAINING OF SCHOOLMISTRESSES.

Examination conducted by Her Majesty's Inspectors of Schools,
 the Rev. Frederick Watkins, B.D., late Fellow of Emanuel
 College, Cambridge.

MIDDLE CLASS CERTIFICATE.

FIRST DIVISION.

Kyberd, S., a student.

SECOND DIVISION.

Coleman, A., a student
Maple, E., a student.

THIRD DIVISION.

English, A., Redmarley, Worcestershire.

LOWER CLASS CERTIFICATE.

FIRST DIVISION.

Mason, M., a student
Ould, M., a student
Stibbs, A., a student.

SECOND DIVISION.

Davis, M., a student
Moore, C., Horbury, Yorkshire
Ransom, E., Whitechurch, Kent
Shore, J., a student
Street, M., a student.

THIRD DIVISION.

Anderson, M., a student
Cleaver, L., a student
Houseley, A. A., Naswick, in the parish of Bainton, Yorkshire
Inman, M. A., Thames Ditton, Surrey
Johnson, E., Bassingbourne, Cambridgeshire
Kenrick, D., a student
Kerslake, M. A., Dowlais, Sir John Guest's School
Lamb, C., a student
Perry, C., a student
Rawlinson, S., Dowlais, Glamorganshire
Regnali, H., Stepney, All Saints', Middlesex
Sawyer, E., a student
Tate, H., a student
Tucker, M., a student
Webb, E., a student
Wilson, C., a student.

TRAINING INSTITUTION OF THE DIOCESAN BOARD OF EDUCATION AT CHESTER.

Examination conducted by Her Majesty's Inspector of Schools,
the Rev. Henry Moseley, M.A., F.R.S., with the assistance of
the Rev. J. J. Blandford, M.A., Her Majesty's Inspector of
Schools.

MIDDLE CLASS CERTIFICATE.

FIRST DIVISION.

Hardy, J. E., Stretford, Lancashire.

SECOND DIVISION.

Smith, J., Winwick, Lancashire

Thorpe, G., Garstang, St. Michael's, Lancashire.

THIRD DIVISION.

Heywood, E. H., Liverpool, St. Bride's.

LOWER CLASS CERTIFICATE.

FIRST DIVISION.

Hartley, F. R., Higher Bebbington, Cheshire

Murphy, J. L., Liverpool, St. Augustine's

* Parkinson, R., Cheetham Hill, St. Mark's, in Manchester

Willson, J., Hawarden, St. John's.

SECOND DIVISION.

Bentley, R., Middleton, Lancashire.

THIRD DIVISION.

Anderson, W., a student

Bakewell, T., a student

Beckett, C., Toxteth Park, St. Thomas', in Liverpool

Boardman, A., Lower Bebbington, Cheshire

Booth, J. W., Headingley Glebe School, Yorkshire

* Gurwen, M., Seaforth, Lancashire

Eccleston, J., Halsall, Lancashire

Goulding, G., Broxton, Cheshire

Houghton, E., Liverpool, St. Luke's

Hughes, C., Chorlton, St. Clement's, Lancashire

Jones, H., a student

Roberts, R., Kendal, National School

Sharratt, W., Salford, Lancashire, Model School

* Wescoe, H., Preston, St. Paul's, Lancashire

* Worthington, T., Swinton, Industrial School

INSTITUTION OF THE DIOCESAN BOARD OF EDUCATION AT SALISBURY,

FOR THE TRAINING OF SCHOOLMISTRESSES.

Examination conducted by Her Majesty's Inspector of Schools,
the Rev. F. C. Cook, M.A.

MIDDLE CLASS CERTIFICATE.

FIRST DIVISION.

Holland, M. A.

Hickman, E. S., Stoke Orchard, Gloucestershire

SECOND DIVISION.

Read, S. A.

LOWER CLASS CERTIFICATE.

FIRST DIVISION.

Hiller, M., Chippenham, National School

Norris, A.

Noyler, K., Nunton, Wiltshire

Nutley, E. A.

Webster, M., Winchester, Rev. Canon Woodroffe's School.

SECOND DIVISION.

Kingston, F.

TRAINING INSTITUTION OF THE YORK AND RIPON DIOCESAN BOARD OF EDUCATION AT YORK.

Examination conducted by Her Majesty's Inspector of Schools,
the Rev. Alexander Thurtell, M.A., Fellow and lately Tutor of
Caius College, Cambridge; with the assistance of the Rev.
Muirhead Mitchell, M.A., Her Majesty's Inspector of Schools.

MIDDLE CLASS CERTIFICATE.

SECOND DIVISION.

Armitage, J. A., Methley, Yorkshire

* Hardcastle, J., York Training Institution, Junior Master

Hearfield, D., Elland, Yorkshire

Jarmain, G., Almondbury, Yorkshire, Central National School

THIRD DIVISION.

Hugton, T., Walmgate, in York
Wandsworth, J., Leeds, St. Andrew's.

LOWER CLASS CERTIFICATE.

FIRST DIVISION.

Carr, G. S., Kirkdale, St. Stephen's
• Douthwaite, W., Scampston, Yorkshire
Kitchingman, J., Wakefield, Holy Trinity.

SECOND DIVISION.

Hobson, H., Croft, Yorkshire
Lyne, J. H., Leeds, St. George's
Morton, B., Dunnington, Yorkshire
Morton, J., Roecliffe, Yorkshire
Silversides, C., Roos, Yorkshire.

THIRD DIVISION.

Bolton, J.
Brooke, W. S., Middleham, Yorkshire, Parochial School
Close, R., Cross Hills, in Halifax
Gardiner, W., Bowling, St. John's, Yorkshire
Maynard, J., Owersby, Lincolnshire
• Schofield, W., Huddersfield, St. Paul's
Wilcox, B., Wadsley, Yorkshire
Wilkinson, T. P., Woodhouse, in Huddersfield
Williams, J.
Worsnop, T., Sherburn, near Tadcaster, Yorkshire.

EASTER EXAMINATION, 1848.

Schoolmasters who have obtained Certificates of Merit, after having been examined by Her Majesty's Inspectors of Church of England Schools, in their several districts, at the Public Examinations for Masters in charge of Schools, whether educated in Training Schools or not.

HIGHER CLASS CERTIFICATE.

SECOND DIVISION.

Pringle, J. W., Southwark, St. Mary's Old Kent Road, London.

THIRD DIVISION.

Adams, W., Birmingham, St. Philip's

Close, G., Longroyd Bridge
 Cramton, F. R., St. John's Wood, London
 Gill, J. W., Alton, Staffordshire
 Passingham, W., Portsea, All Saints' National School
 Pink, R., Dunham, National School
 Simpson, B., Saxilby, Lincolnshire, National School

MIDDLE CLASS CERTIFICATE.

FIRST DIVISION.

Barton, W. H., Fleetwood, Lancashire, Testimonial School
 Bellamy, W., Manchester, Granby Row
 Cawthorne, J. P., Hurstmonceaux, Hailsham
 Dickson, J. S., Dewsbury, Middle School
 Ellis, J., Buckley, St. Matthew's, parish of Mold
 Floyd, R., Longhirst, National School
 Halstead, B., King's Somborne, Hampshire
 Hardman, R., Crewe, Cheshire
 Hicks, W., Clapham, Surrey, Bowyer's School
 Hidshaw, W., Christchurch, Salford, Lancashire
 Jeffery, W., Cheltenham, St. John's
 Kent, G., Falmer, Sussex
 Murray, A., Leeds, Workhouse School
 Sutcliffe, J., Cheltenham, St. Paul's
 Wade, G., Wolverhampton, St. Paul's
 Wilkins, J., a student in the Cheltenham Training Institution

SECOND DIVISION.

Banson, J., Fakenham, Norfolk, National School
 Farnham, J. J., Highgate, Middlesex, National School
 Hardham, J. T., Manchester, St. Anne's
 Holt, W. H., Wednesbury, St. James'
 Oke, S., Illogan, Cornwall
 Wede, W., Kingswinford, Worcestershire
 Wilkins, T., Mokeley, Staffordshire
 Wynne, E., Oswestry.

THIRD DIVISION.

Abbott, H., Newington, Surrey, Holy Trinity
 Allan, J., Birkenhead, Holy Trinity
 Baldwin, J., Worsley, Lancashire
 Broadbent, D., Atherton, Lancashire
 Chate, W., St. Erth, Cornwall, National School
 Edney, W. H., Sunderland Gray School
 Foster, C., Camden Town, Surrey
 Gowthorpe, W., Welton, Yorkshire

Holmes, G., Burley (Leeds) National School
 Holmes, R., Oakworth, Yorkshire
 Hope, W., South Shields, Trinity
 Houghton, J., Meltham Mills in Huddersfield
 Hyde, H., London Colney, Hertfordshire
 Isaac, A., Martock, Somerset, National School
 Jameson, T., Sigglethorne, Yorkshire, Endowed School
 Lawford, T. H., Meltham, in Huddersfield
 Liddiard, W. J., Kesgrave, Suffolk
 Lumby, J. R., Meanwood, Yorkshire
 Palmer, E., Tamworth, National School
 Reid, J., Plaistow, Essex
 Rider, H., Worminghall, Buckinghamshire
 Righton, W., Ripley, Derbyshire
 Scott, T. E., Leeds, All Saints', Pontefract-lane
 Self, J., West Ham, Essex
 Skeet, W., Egerton, Kent, National School
 Warren, R., Westminster, St. John's, Free School
 White, W., Gillingham, National School
 Willett, C., Hulme, Holy Trinity, in Manchester
 Wilson, W. B., Winchester, Central School

LOWER CLASS CERTIFICATE.

FIRST DIVISION.

Bailey, R., Taunton, Holy Trinity
 Batty, S., Bradford, St. James'
 Bolton, J., Hunslet, in Leeds
 Broomfield, R., Pontypool, Town School
 Brown, J., Sheffield, St. Paul's, National School
 Brown, W., Halifax, South-east School
 Bryan, J., Aylsham
 Collins, A. W., Fulham, All Saints', London
 Cooper, H., Preston, Holy Trinity
 Davis, J., St. Breage, Cornwall
 Fastman, R. M., Leeds, St. James'
 Flaxman, S., Great Ryburgh, Norfolk
 Gibson, J., Northallerton
 Gooding, C., Upper Chelsea, Middlesex, National School
 Horsfield, I., Dean, National School, Lancashire
 Jackson, S., Wolverhampton, St. John's
 Jennings, C., Sutton-in-Ashfield, Nottinghamshire
 Leete, F., Harrow, National School

Mayer, J., Derby, Trinity
 Neild, J., Manchester, Cathedral School
 Pearson, W., York, Manor School
 Pullen, M., Dukinfield, St. John's, Staffordshire, National School
 Smith, G., South Collingham, Nottinghamshire
 Tearle, E., Cheam, Surrey
 Thurlow, R., Nottingham, Trinity Church School
 Wakeley, W., St. Weonard's, Herefordshire
 Ward, J., Hoyland, Yorkshire
 Young, J., Houghton-le-Spring, Durham

SECOND DIVISION.

Allport, J., Little Eaton, Derbyshire
 Anderson, R., Ollerton, Nottinghamshire
 Balfrey, W., Keighley, Yorkshire
 Brays, J. H., Bolsover, Derbyshire
 Britan, J., Croydon, Surrey
 Clarke, A., Wimborne Minster, Dorsetshire
 Collier, J., Ecclesall, National School
 Coxhead, W. P., Hampstead, Middlesex, Parochial School
 Cummings, H., Derby, St. Werburgh's, National School
 Dixon, C., Cambridge, St. Paul's
 Durban, C., Seaton Carew, Durham, National School
 Flint, J., Weybridge, Surrey
 Forsythe, W., Chelmsford, National School
 Freeman, J., Speen, Berkshire, Parochial School
 Glanville, J. S., a student, Cheltenham Training Institution
 Hancock, E., Huddersfield, Trinity
 Harding, P. H., Elham, Kent, National School
 Horsman, T., Pontnewynydd, Monmouthshire, National School
 Jones, J., Bottisham, Cambridgeshire
 Lowe, R. T., Hornsey, Middlesex
 Lowres, J., Cardiff, Glamorganshire
 Martyn, G., Farnham, Surrey, National School
 Newton, F., Leeds, St. Saviour's
 Parkin, W., Stannington, Yorkshire, National School
 Priestley, W., Earl's Heaton, Yorkshire
 Putterill, W., Skirbeck, Lincolnshire
 Rathbone, J. T., Norbury, Staffordshire, National School
 Sharman, A., Leeds, St. Philip's
 Sower, J. H., Shardlow, Derbyshire, Parochial School
 Vaughan, W., Westminster, Christchurch
 Woodcock, H., Market Drayton
 Woolstenholme, T., Heywood, St. Luke's, Lancashire

THIRD DIVISION.

Andrews, R., Liverpool, Christchurch
Appleby, J., Lexden, Essex, National School
Barnsley, G., Northampton, St. Sepulchre's
Barraclough, J., Middleton, Yorkshire
Batchelder, J., Standish, Lancashire, Lower Grammar School
Bottomley, T., Upper Slaithwaite, Yorkshire
Bradbury, W., Grappenhall, Lancashire
Buckley, O., Smallbridge, St. John's, Lancashire, National School
Canner, W., Leigh, Lancashire, National School
Cockren, R., Lenton, Nottinghamshire
Copeland, H., Windsor, St. Clement's, in Liverpool
Denner, J., Redhill, St. John's, Surrey, National School
Eaton, W., Stourport
Glover, H., Kirkdale, St. Mary's, in Liverpool
Grimsdale, E., Launton, Oxfordshire
Grumbold, H., Salford, St. Bartholomew's National School
Harker, T., Birstal, Yorkshire, National School
Holloway, G., Kildwick, Yorkshire
Jeayes, L., Rugby, Elborow's Charity School
McDonald, W., Wood Ditton, Cambridgeshire
Miles, W., Cainscross, Gloucestershire, National School
Monday, W., Bermondsey, in London
Nibbs, J. S., Baslow Church
Nicholson, J., Gainsborough, National School
Orford, G., Harrietsham, Kent
Owers, C., Springfield, Essex
Preston, J. E., Doncaster, National School
Roach, C., Whitechapel, St. Mark's
Roberts, J., Wadsworth, Yorkshire
Robinson, G., Wolborough and Highweek, Devonshire
Russell, J., Walsall, Staffordshire
Smart, J., Wakefield, St. Andrew's
Smith, C. H., Cheltenham, Charity School
Spooner, W., Rugeley, Staffordshire, National School
Stephens, E., Bishop's Waltham
Thorndick, J., Wendover
Turner, G., Brailsford, Derbyshire
Vernon, G., Bristol, Hannah More's Infant School
Westbrook, R., East St. Pancras, in London
Wood, R., Coley, Yorkshire

SCHOOLMASTERS AND STUDENTS

TO WHOM CERTIFICATES OF MERIT HAVE BEEN GRANTED
BY THE COMMITTEE OF COUNCIL, ON PASSING MR. GIB-
SON'S EXAMINATION, AT EDINBURGH, IN MAY, 1848.

MASTERS.—FIRST CLASS.

None.

SECOND CLASS.**FIRST DIVISION.**

Dingwall, R., Edinburgh, N. Dis., F.C.S., Edinburgh
Graham, G., Roxburgh, F.C.S., Edinburgh
Lillie, T., Callender, F.C.S., Callender
Stalker, D., Dalketh Academy, Dalketh

SECOND DIVISION.

Lillie, R., Linlithgow, F.C.S., Linlithgow
Wilson, D., Edinburgh, St. Mary's, Edinburgh

THIRD DIVISION.

Band, F., Portobello, F.C.S., Edinburgh
Sowter, F., South Leith, F.C.S., Leith
Wason, R., St. David's, F.C.S., Edinburgh
Wilson, A., Tranent, F.C.S., Tranent

THIRD CLASS.**FIRST DIVISION.**

Cameron, J., Logierait, F.C.S., Dunkeld
Fullarton, A., Bridge of Earn, S., Bridge of Earn
Hunfer, J. C., Methven Unit. Presb. S., Perth
Ross, A., Eyemouth, S., Ayton

SECOND DIVISION.

Kidd, W., Greenlaw, F.C.S., Greenlaw
McPherson, G., Free Tolbooth, Congl. S., Edinburgh

THIRD DIVISION.

Coullie, J., Methven, S., Perth
Roxburgh, Lawrence, Roxburgh, F.C.S., Edinburgh
Wilson, W., Kincardine, Kincardine

STUDENTS.—FIRST CLASS.

None.

SECOND CLASS.

FIRST DIVISION.

None.

SECOND DIVISION.

John Cameron

| William Gunn

THIRD DIVISION.

Alexander Buchan

| John Mylne

James William Gillespie

THIRD CLASS.

FIRST DIVISION.

Alexander Anderson

| William McKay

Alexander Fortune

| David Walker

SECOND DIVISION.

James Fullerton

THIRD DIVISION.

George Barnett

| Charles McKenzie

William Doherty

| Donald McRae

John Dow

| Richard Pearson

John Finlayson

| Alexander George Slight

John Grant

MR. GIBSON'S EXAMINATION,

GLASGOW, MAY, 1848.

MASTERS.—FIRST CLASS.

FIRST DIVISION.

None.

SECOND DIVISION.

None.

THIRD DIVISION.

Mitchell, J., Hamilton, F. S., Glasgow

SECOND CLASS.

FIRST DIVISION.

Smith, J., Bothwell, F. S., Uddington, Hamilton

SECOND DIVISION.

Robertson, J., Hamilton, F. C. Seminary, Hamilton

THIRD DIVISION.

Adams, J., Leewalt S., Stranraer
Blain, R., Alexandria F. C. S., Dumbarton
Lennie, G., Free St. George's S., Glasgow

THIRD CLASS.

FIRST DIVISION.

None.

SECOND DIVISION.

Macallum, P., Free St. Mark's S., Glasgow

THIRD DIVISION.

Ross, H., Foreland School, Bowmore

STUDENTS.—FIRST CLASS.

None.

SECOND CLASS.

FIRST DIVISION.

None.

SECOND DIVISION.

Alfred Fry.

THIRD DIVISION.

Thomas Moore.

THIRD CLASS.

FIRST DIVISION.

James Mavor	|	Robert Norman
		William Young.

SECOND DIVISION.

James Bailey	|	William Holloway
James Hall		Henry Oakley.

THIRD DIVISION.

William Bissett		Robert Hurworth.
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N.B.—It is gratifying to be able to state, at the end of this long list of names, that many would have stood higher, had not the masters been obliged to return to their duties at the termination of the first week's examination. This intimation may be of importance to masters who intend to present themselves as candidates for certificates at the next general examination; absence from school duties, for a fortnight at least, should be secured.

ERRATA.

For "utilite" read utilit —Title page.

For "benefactor" read benefactors—Preface, page iv.

For "addative" read additive—page 18.

For "of attempting the hopelessness of attaining useful' much knowledge" read of the hopelessness of attempting to attain much useful knowledge—page 220, lines 12 and 13.

For "0 2 b² 0" read 2 b²—page 25. The correct position of the words, "brought to a common denominator," will be perceived.

For "Appendix i." read Appendix iii.—page 58.



